PROCEEDINGS *of the* HAWAIIAN ENTOMOLOGICAL SOCIETY *for* 1958

VOL. XVII, No. 1
AUGUST, 1959

Suggestions for Manuscripts

Manuscripts should be typewritten on one side of standard-size white bond paper, double or triple spaced, with ample margins. The sheets should not be fastened together; they should be mailed flat. Pages should be numbered consecutively. Inserts should be typed on separate pages and placed in the manuscript in the proper sequence.

Footnotes should be numbered consecutively and inserted in the manuscript immediately below the citation, separated from the text by lines. They should be used only where necessary.

All names and references should be checked for accuracy, including diacritical marks. Authors' names must be spelled out when first mentioned.

Illustrations should be planned to fit the type page, 4½ x 7 inches. They should be drawn to allow for at least one-third reduction. Each should be labeled on the back with the author's name and title of the paper, as well as the number of the figure referred to in the text. Where size or magnification is important, some indication of scale should be given. They should be numbered consecutively, using capital letters to indicate parts of a composite figure. Printed letters are available from the Secretary. Legends should be typed on a separate sheet of paper and identified by the figure number.

Tables and graphs should be used only where necessary and omitted if essentially the same information is given in the paper. Graphs and figures should be drawn in India ink on white paper, tracing cloth, or light blue cross-hatched paper.

Proofs should be corrected as soon as received and returned to the editor with the abstract on forms provided. Additional costs to the Society for correction of authors' changes in proofs may be charged to authors. An order for reprints should be placed when proofs are returned.

Fifty gratis copies of reprints will be supplied by the Society to authors under certain circumstances. The Secretary should be consulted on this point.

Examination of articles in this issue will help in conforming to the style of presentation desired.

PROCEEDINGS

of the

Hawaiian Entomological Society

VOL. XVII, NO. 1 FOR THE YEAR 1958 AUGUST, 1959

JANUARY 13, 1958

The 625th meeting of the Hawaiian Entomological Society was held at the Experiment Station; HSPA, at 2:00 P.M. on Monday, January 13, 1958, with President Tuthill presiding.

Members present: Adachi, Balock, Beardsley, Bess, Bianchi, Boyle, Burditt, Chilson, Chock, Chong, Clagg, Davis, Fullaway, Gressitt, Hardy, Hinckley, Hirst, Holloway, Isenburg, Joyce, Kajiwara, Kamasaki, Keck, Kim, Krauss, Look, Maeda, Maehler, McGee, Mitchell, Nakata, Nishida, Ota, Pemberton, D. Rainwater, Rosa, Sherman, Steiner, Suehiro, Thistle, Woolford, and Yoshimoto.

Visitors: Mr. Ed Littooy and Mr. P. A. Mourikis.

Dr. Pemberton delivered an informative talk on the meetings of the Entomology Section of the Ninth Pacific Science Congress, held in Bangkok during November of 1957. Dr. Gressitt gave an excellent Kodachrome-illustrated account of his recent collecting trip through the New Hebrides, Solomon Islands, New Guinea, British Borneo, and Thailand.

NOTES AND EXHIBITIONS

Entomological Projects at the B. P. Bishop Museum: Dr. Gressitt presented the following information:

"Dr. Larry W. Quate will join the museum staff in February and will work on the museum's project on 'South Pacific Insects of Public Health Importance'. Also working on this project will be Mr. T. C. Maa of Taiwan who will be on a three-year field fellowship. Mr. Maa will proceed shortly to Malaya, Thailand, and British Borneo. Dr. John Smart of Cambridge University has already spent about five months in New Guinea on this project, and will soon leave for Australia. Between March

and July of this year the museum will send Dr. Fred M. Snyder of the Army Chemical Warfare Laboratory to the Bonin Islands, and Dr. Elizabeth Marks of the University of Queensland to New Guinea. Dr. Quate will also be doing field work this year.

"On the 'Zoogeography of Pacific Insects' project, Mr. Brandt has moved from the upper Fly River to the south side of the Owen Stanley Mountains. The museum hopes to send another person into the field on this grant during 1958.

"Mr. Noel Krauss has just returned from several weeks of collecting in the Gilbert Islands for the 'Insects of Micronesia' project. Seven issues of the INSECTS OF MICRONESIA series have come off the press during the past few months."

Cyclamen mite damaging Emex: Mr. Davis reported severe damage to potted *Emex spinosa* Campd. plants by the cyclamen mite, *Steneotarsonemus pallidus* (Banks). The plants were on propagating benches near the Board of Agriculture and Forestry insectary, and were being used for breeding *Apion antiquum* Gyllenhal and *A. neofallax* Warner. The mites were identified by Dr. Boyle who stated that *Emex* is a new Hawaiian host record for the cyclamen mite.

Halictus (Chloralictus) sp.: Mr. Beardsley reported that additional specimens of this newly established immigrant bee ("PROCEEDINGS" 16(3):337, 1958)[1] have been collected recently in the vicinity of Ewa, Oahu. Mr. P. H. Timberlake has written that specimens sent him from Honolulu appear to belong to an unnamed species close to a species which he has in manuscript from Riverside, California, and that the closest described species is *H. nevadensis* Crawford.

National Science Foundation grant for "Insects of Hawaii": Dr. Tuthill reported that a three-year National Science Foundation grant has been made to the University of Hawaii for continuation of work on the INSECTS OF HAWAII series. Volumes 7 and 8, MACROLEPIDOPTERA and PYRALOIDEA respectively, by E. C. Zimmerman, are now in the hands of the printers.

Dr. Joyce presented notes on the following rodent parasites:

Polyplax spinulosa (Burmeister): A massive infestation of this louse was discovered recently on a rat, *Rattus rattus* (L.), which was found dead near a warfarin bait station in Honolulu. A total of 2171 adult and nymphal lice were removed from the rat, first by searching and brushing and then by the dissolving technique. Such large populations rarely occur on normal healthy wild rats, as natural control factors seem to keep the lice in check. This particular rat was a young individual which apparently had injured a leg sometime prior to its death.

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[1] Throughout this publication "PROCEEDINGS" refers to PROCEEDINGS OF THE HAWAIIAN ENTOMOLOGICAL SOCIETY.

Moniliformis moniliformis (Bremser): A number of specimens of this acanthocephalan worm (see Faust, E. C.; ANIMAL AGENTS AND VECTORS OF DISEASE p. 438, 1955) were taken from the small intestine of the rat mentioned in the previous note. About fifty per cent of the rats taken in recent months in the Fort Armstrong area of Honolulu have been found parasitized by this worm. The species is also reported to be an occasional parasite of man, and is of entomological interest in that cockroaches and some beetles serve as intermediate hosts in which the eggs hatch and the larval worms develop.

Listrophorus sp.: A number of specimens of a very small fur mite of the family Listrophoridae (see Baker, E. W. & G. W. Wharton; AN INTRODUCTION TO ACAROLOGY pp. 376–378, 1952) have been collected in Honolulu during the past several years from the mouse, *Mus musculus* L. The first collection was made on August 14, 1953. The determination was made by E. W. Baker at the U. S. National Museum. This genus has not previously been reported from the Hawaiian Islands. However, there are two slide-mounted specimens in the HSPA collection taken from *M. musculus* at Honokaa, Hawaii, November 20, 1922, by C. E. Pemberton, which were determined as *Listrophorus* by H. E. Ewing.

FEBRUARY 10, 1958

The 626th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, February 10, 1958, with President-elect Nishida presiding.

Members present: Adachi, Balock, Beardsley, Bess, Burditt, Carter, Chilson, Chock, Chong, Davis, Fullaway, Gressitt, Hardy, Holloway, Isenburg, Joyce, Kajiwara, Kamasaki, Keiser, Kim, Krauss, Look, Maeda, Macdougall, McGee, Nakata, Namba, Nishida, Pemberton, Sherman, Suehiro, Thistle, and Yoshimoto.

Visitors: Dr. William Cantelo, Mr. Garth Lukins, Mr. Harold Toba, and Mr. Ernest Yoshioka.

Dr. William Cantelo and Mr. P. A. Mourikis were nominated for membership in the Society.

The Society voted to contribute fifty dollars to help support the Hawaii Science Fair which is to be held during April.

Mr. Krauss gave an interesting account of his work and travel during the past eighteen months. While searching for enemies of the giant African snail, lantana, and other pests for the Territorial Board of Agriculture and Forestry, Mr. Krauss visited Florida, Cuba, Europe, North Africa, South and Central Africa, India, Philippine Islands, and Guam.

NOTES AND EXHIBITIONS

Pseudococcus brevipes (Cockerell): Mr. McGee reported that mealybugs which he had found feeding on the roots of a clover, *Melilotus indica* All., at Haleiwa, Oahu, during June, 1957 had been identified as this species by Mr. Beardsley. This constitutes a new host record of the pineapple mealybug in Hawaii. When discovered, the mealybugs were being tended by the ant *Pheidole megacephala* (Fabricius).

Dermacentor albipictus (Packard): Mr. Fullaway reported that an engorged specimen of this tick had been removed from a horse which was brought into the Territory from the mainland United States early this month. This is the second time within a year that a horse has arrived here bearing ticks of this species (see "PROCEEDINGS" 16 (3) :322–323, 1958).

Lantana insects on Maui: Mr. Krauss reported that during January he had found caterpillars of the noctuid moth *Catabena esula* Druce feeding on Lantana in the Hana and Kaupo areas of Maui. This is the first record of the establishment of this purposely introduced lantana enemy on Maui. Mr. Krauss also observed the work of caterpillars of the pyralid moth *Syngamia haemorrhoidalis* Gueneé on lantana on Maui.

Aphonopelma clarum Chamberlin: Mr. Look stated that the large theraphosid spider which was intercepted in Honolulu by a Territorial plant quarantine inspector during October, and was exhibited at the meeting of November 18, 1957 ("PROCEEDINGS" 16 (3) :336), had been identified as this species by Dr. W. J. Gertsch.

Salmacia longipulvilli (Tothill): Dr. Gressitt called attention to a paper by Paul H. Arnaud, Jr. titled "The occurrence of *Salmacia longipulvilli* in the Hawaiian Islands (Diptera: Larvaevoridae)" (ENT. NEWS 68 (10) :259–263, 1957). This fly has not been reported here previously. Dr. Arnaud records it from Maui and Hawaii, but specimens in the HSPA collection indicate that it occurs also on Oahu. One specimen was reared by Swezey from a pupa of *Agrotis ipsilon* (Hufnagel).

Sipalinus sp.: Mr. Chilson exhibited a specimen of this large curculionid weevil which was intercepted recently at the Honolulu Airport in baggage from Japan.

MARCH 10, 1958

The 627th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, March 10, 1958, with President Tuthill in the chair.

Members present: Adachi, Beardsley, Bess, Boyle, Burditt, Carter, Clagg, Chilson, Chong, Fullaway, Gressitt, Haramoto, Hardy, Holloway, Isenburg, Joyce, Kajiwara, Kamasaki, Keck, Look, Maeda, Maehler, Macdougall, McGee, Mitchell, Miyake, Mourikis, Nakata, Nishida, Ota, Pemberton, Sherman, Suehiro, Tamashiro, Thistle, Tuthill, and Yoshimoto.

Visitors: Mr. Garth Lukins and Mr. Rodolfo Ela.

Mr. Harold Toba and Mr. Garth Lukins were nominated for membership in the Society. Dr. William Cantello and Mr. P. A. Mourikis were elected to membership.

Dr. W. C. Mitchell gave an interesting account, illustrated by Kodachrome slides, of the current program of research which is being conducted at the U.S.D.A. Fruit Fly Laboratories in Hawaii.

Notes and Exhibitions

Biological control projects of the Board of Agriculture and Forestry: Mr. Thistle announced that the Territorial Board of Agriculture and Forestry recently has undertaken two major biological control projects. These are: (1) the search for enemies of the snail *Lymnaea ollula* (Gould), which is the intermediate host for the liver fluke of cattle in Hawaii; and (2) the search for additional enemies of gorse, *Ulex europaeus* L., a serious rangeland weed pest. Mr. N. L. H. Krauss is now in the Orient searching for *Lymnaea* enemies, and Mr. C. J. Davis will soon depart for Europe and North Africa where he will search for gorse enemies. Secondary projects, to be carried on concurrently with the above, will be the search for enemies of the weed pests *Rhodomyrtus tomentosa* (Ait.) Hassk. and *Melastoma malabathricum* L. by Mr. Krauss, and for enemies of *Emex* spp. by Mr. Davis.

American Mosquito Control Association meetings: Dr. Joyce reported that he had returned recently from Washington, D. C., where he attended the meetings of the American Mosquito Control Association. Dr. J. M. Hirst, a member of our Society, is the current president of the Association.

Anacamptodes fragilaria (Grossbeck): Mr. Fullaway reported that Mr. Krauss had collected caterpillars of this geometrid moth at Hana, Maui, during February, 1958; on leaves of Java plum, *Eugenia cumini* (L.) Druce. This is a new host record for the moth.

Hyalopeplus pellucidus (Stål): Mr. Ota reported that he and Dr. Nishida recently had found this mirid plentiful on mango foliage at Poamoho, Oahu. Whether these bugs were feeding on mango leaves was not determined.

Anthenus flavipes LeConte: Mr. Clagg reported that a severe infestation of this dermestid beetle had been found in curled cattle hair used

for mattress stuffing which was being stored in a warehouse at the Pearl Harbor Naval Supply Center. One hundred thirty-eight bales of hair totaling about 7,000 pounds were infested with beetles at a rate of about 25 adults per pound. There were also many beetles flying about the warehouse. Infested bales were first sprayed with a 2% chlordane emulsion, and then placed in a heat treatment room at 140 degrees F. for 4 hours to destroy all stages of the beetle. The inside of the warehouse was treated with a 10% DDT dust.

Toxorynchites splendens (Weidemann): Dr. Hardy stated that an adult specimen of this predaceous mosquito had been captured recently at the Dole Street Laboratory of the USDA. The species appears to be established here, but it is not commonly seen.

Elytroteinus subtruncatus (Fairmaire): Mr. Rosa exhibited specimens of this weevil which he had reared from tubers of the bird-of-paradise plant, *Strelitzia reginae* Banks. Some of the infested plants were in a dying condition, apparently due to the feeding of the weevil grubs. This constitutes a new host record for the weevil.

Telea polyphemus (Cramer): Mr. Rosa exhibited a specimen of this large saturniid moth which had been brought in alive to the Experiment Station, HSPA during February by two boys. The boys stated that the moth had emerged from a cocoon which was attached to furnishings shipped here from California. According to Essig (Insects of Western North America pp. 670–671, 1926) this species ranges throughout the United States and the larvae feed on the foliage of a number of deciduous trees, including apple, peach, prune, and plum.

Eidoleon sp.: Miss Suehiro exhibited specimens of an endemic myrmeleontid from the Bishop Museum collection. These are noteworthy in that they were collected several years ago at Puu Kapele, Kauai, by Mr. E. H. Bryan, Jr., and constitute the first and only record of antlions from that island.

Plusia (Autographa) biloba (Stephens): Mr. Beardsley exhibited a specimen of this noctuid moth which was taken in a light trap at Waipio, Oahu, during February. The moth has been present in the Territory for many years, but is very seldom collected here.

April 14, 1958

The 628th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, April 14, 1958, with President-elect Nishida presiding.

Members present: Adachi, Awai, Balock, Beardsley, Bianchi, Burditt, Carter, Chilson, Chock, Chong, Ford, Fullaway, Gressitt, Haramoto, Hardy, Joyce, Kajiwara, Kamasaki, Kim, Look, Maeda, Maehler, Macdougall, McGee, Mitchell, Mourikis, Nakata, Nishida, Ota, Pemberton, D. Rainwater, Rosa, Sherman, Steiner, Suehiro, Tamashiro, Woolford, and Yoshimoto.

Visitors: Mr. Shinsaku Kimoto and Dr. Larry W. Quate.

Mr. Rudolfo Ela, Mr. Kimoto, and Dr. Quate were nominated for membership in the Society. Mr. Lukins and Mr. Toba were elected to membership.

Through the courtesy of Mr. Maehler and the USDA Plant Quarantine Service an interesting colored motion picture entitled "The Hidden Menace" was shown which depicted the various activities of the Quarantine Service.

Notes and Exhibitions

Dr. Hardy presented the following five notes:

Amygdalops tomasseti Lamb: This anthomyzid fly (Trans. Linn. Soc. London 16:359, 1914) was reported by Wirth ("Proceedings" 13 (1) :21, 1947) as *"Mumetopia* sp.?", and later was determined by Sabrosky as *"Ischnomyia?* prob. n. sp." (Hardy, "Proceedings" 14 (3) :447, 1952). Miss M. S. Adachi recently suggested that our species was probably the same as that which Lamb had described from the Seychelle Islands, and C. F. Sabrosky has confirmed this identification.

Scaptomyza (Parascaptomyza) pallida Zetterstedt: According to W. Hackman of Helsingfors, Finland, this name (Dipt. Scand. 6:2571, 1847) is the correct one for the drosophilid fly which has been referred to in the Hawaiian literature as *Scaptomyza graminum* (Fallen). The latter species is a leaf miner and apparently does not occur in Hawaii. *S. pallida* is a scavenger and is common in the lowlands throughout the islands. The species is widespread throughout Europe, Asia, North America, and North Africa, and probably occurs throughout the Pacific.

Phytobia (Amauromyza) maculosa (Malloch): Larvae of this leaf-mining agromyzid fly were found infesting leaves of fireweed, *Erechtites hieracifolia* (L.) Raf., at Hilo, Hawaii, November 9, 1957, by Dr. Nishida. This is a new host and a new island record for the species.

Eumerus marginatus Grimshaw: Ginger roots infested with this syrphid fly were sent in from Hilo, Hawaii, during April, 1958, by the extension agent, Mr. Y. Nakagawa. The roots were in a rotting condition and there was no evidence that the syrphid larvae actually had been boring in healthy tissue. Only pupae and one emerged adult were present in the

sample submitted. There is some possibility that this fly may be economic importance as some *Eumerus* are important bulb infestors in other areas (e.g.: *E. tuberculatus* Rondani is the lesser bulb fly of the U.S.). In the past *E. marginatus* has been reared from lily bulbs and ginger roots on Oahu, but rots were present in all cases and the species may be strictly a scavenger.

Scatopse fuscipes Meigen: On April 3, 1958, Mr. Jonathan Kajiwara brought in a large grass tassel which was covered with great masses of the adult of this scavenger fly. The massing of the adults of this species, which were clustered together by the thousands in this case, has not been reported previously here.

Orchidophilus spp.: In a recent letter to Dr. Gressitt, Dr. H. Bytinski-Salz, Chief Entomologist, Ministry of Agriculture, Israel, stated that every year his department receives several shipments of insect-infested plants from Hawaii. Most of the living insects are scales, but last year *Vanda* cuttings with tips heavily infested by curculionid or scolytid borers were intercepted. The borers are presumed to have been *Orchidophilus* weevils, of which there are two species in Hawaii.

Luring fruit flies in the South Pacific: In the light of remarks by Dr. Mitchell at the previous meeting concerning fruit fly lures, Dr. Gressit gave notes on the results of his work with the same lures and traps during a trip through the New Hebrides, Solomons, Bismarks, New Guinea, Borneo, Thailand, and Luzon in the Philippines. The five lures used were methyl eugenol, anisyl acetone, angelica seed oil, "no. 21486", and a mixture. The "no. 21486", a Mediterranean fruit fly lure, was negative at every locality. The others all were negative in the New Hebrides, but all were positive for one or more species of *Dacus* in the Solomons, on New Britain, and at Wewak, New Guinea. At Hollandia and Biak only anisyl acetone was positive, but the environments tried were poor. Near Sandakan, Borneo, only anisyl acetone was positive, and in Thailand only anisyl acetone and methyl eugenol were positive. It was thought that some of the wicks, used for so long without replenishment, had dissipated, but at the last locality tried, Clark Field on Luzon, all four proved positive, showing them to be still effective.

Carpophilus marginellus Motschulsky: Mr. Ford exhibited specimens of this nitidulid beetle which has not been reported previously from the Territory. The species has been present here for at least nine years, but, due to its resemblance to the four other species of *Carpophilus* known here, had escaped earlier detection. *C. marginellus* is reported to be nearly cosmopolitan in distribution (Hinton, H. E., BEETLES ASSOCIATED WITH STORED PRODUCTS vol. 1, p. 84, 1945) and has been reported injuring stored rice in the U. S. and infesting a flour mill in England.

Heliothrips haemorrhoidalis (Bouché): Mr. Maehler reported that he had found this thrips heavily infesting the leaves of a sand-box tree, *Hura crepitans* L., in the vicinity of Fort Ruger, Honolulu, during March. This is a new host record for the thrips.

Celerio wilsoni perkinsi (Swezey): Mr. Beardsley exhibited an adult of this rare endemic sphingid moth which he had reared from a caterpillar found feeding on *Straussia* on Mt. Tantalus, Oahu, during February. The mature caterpillar was exhibited at the Society's February meeting.

Spodoptera mauritia (Boisduval): Mr. Beardsley reported collecting an adult female of this armyworm moth at light at Kanakakai, Molokai, on March 25. This is the first record of *S. mauritia* on Molokai.

Anacamptodes fragilaria (Grossbeck): Mr. Beardsley exhibited a specimen of what appears to be a melanistic form of this immigrant geometrid moth. Several such specimens have been taken in HSPA light traps on Oahu during the past year.

Vanessa cardui (L.): Mr. Kim reported seeing hundreds of this nymphalid butterfly feeding at flower heads of *Verbesina encelioides* (Cav.) Benth., a common wild composit, on March 14, 1958, in the vicinity of Camp Erdman, Mokuleia, Oahu. An ichneumonid parasite, *Pterocormus rufiventris* (Brullé), was reared from a larva of this butterfly found feeding on *Malva parviflora* L. at Waianae, Oahu, during March.

MAY 12, 1958

The 629th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA., at 2:00 P.M. on Monday, May 12, 1958, with President Tuthill presiding.

Members present: Balock, Beardsley, Burditt, Chock, Chong, Ford, Gressitt, Haramoto, Hardy, Holloway, Hoyt, Isenburg, Joyce, Kajiwara, Kamasaki, Kimoto, Look, Maeda, Maehler, Mitchell, Mourikis, Nakata, Namba, Nishida, Ota, Pemberton, Quate, Rosa, Sherman, Steiner, Suehiro, Thistle, Toba, Tuthill, Woolford, and Yoshimoto.

Mr. Rudolfo Ela, Mr. Shinsaku Kimoto, and Dr. Larry W. Quate were elected to membership in the Society.

The Society, as an affiliate of the Hawaiian Academy of Science, approved a "Resolution Concerning Future Organization of Annual Hawaiian Science Fairs and Other Inter-Society Efforts on Behalf of Science Education" which had been previously adopted by the 1957 Science Fair Executive Committee and approved by the Affiliation Committee, Hawaiian Academy of Science. Dr. Mitchell was elected to serve as the Society's representative on the Science Education Committee of the Hawaiian Academy of Science, as set forth in the resolution.

Dr. Charles P. Hoyt, entomologist for the South Pacific Commission, gave an interesting account of his work in the current program of research for the control of the coconut rhinoceros beetle, *Oryctes rhinoceros* (L.), as well as other phases of his entomological work for the South Pacific Commission.

Notes and Exhibitions

New chrysomelid beetle on Kwajalein: Dr. Gressitt reported that during a recent trip to the Marshall Islands he collected specimens of the chrysomelid *Pagria signata* (Motschulsky) at Kwajalein. This is the first record of *P. signata* from the Marshall Islands. The species has been known previously from Asia, Japan, the Ryukyu Is., and Guam (Ins. Micronesia 17 (1) : 12, 1955). It is reported to feed on beans.

Bishop Museum Entomology Department activities: Dr. Gressitt reported that Dr. H. E. Milliron stopped here earlier this month en route to Mindanao and Palawan Islands in the Philippines where he will collect insects for the Bishop Museum. Dr. Snyder has written from the Bonin Islands that he has taken two subfamilies of muscid flies new to Micronesia. Dr. Marks has written from New Guinea that she has collected about one hundred species of mosquitoes, many with immature stages, and including a genus new to New Guinea.

Popillia lewisi Arrow: Mr. Ford exhibited specimens of this scarabaeid beetle, a close relative of the notorious Japanese beetle, and reported that on two occasions recently these insects have been intercepted alive by federal plant quarantine officers at Honolulu Airport on aircraft from Okinawa. Twelve beetles were found on an aircraft which arrived on May 7, and three more on another flight which arrived on May 10.

Geococcus coffeae Green: Mr. Beardsley called attention to a recent redescription and figure of this widespread root-inhabiting mealybug in a paper on African mealybugs by the British coccidologist J. D. Williams (Bull. British Mus. (Nat. Hist.), Ent. 6 (8) :205-236, 1958). Williams points out that Green confused this species with his own *G. radicum*, but that the two are distinct. *G. coffeae* has not been reported from Hawaii, but when the available Hawaiian *Geococcus* specimens were examined all were found to fit Williams' concept of that species. This material included specimens from Oahu collected from 1921 to 1956 on roots of croton, oleander, and *Indigofera anil* L.; and from Hilo, Hawaii, collected from the roots of coffee seedlings during June, 1957. Dr. Harold Morrison has written that all Hawaiian *Geococcus* specimens in the U. S.

National Coccid Collection in Washington, D. C., appear to be *G. coffeae*.

D. T. Fullaway, in a paper on *Geococcus radicum* Green in Hawaii ("PROCEEDINGS" 2 (3) :108-109, 1910), mentions the presence of a pair of curved, dorsal, preanal spines on specimens which he studied. According to Williams, these structures are present in *G. coffeae* but not in *G. radicum*. This suggests that *G. coffeae has* been present in Hawaii for many years, and that records of *G. radicum* should be considered questionable.

Ectemnius (Oreocrabro) mandibularis (Smith): Mr. Beardsley exhibited a series of specimens of this endemic crabronid wasp which he collected on Molokai during April. The wasps were taken inside the Molokai airport terminal building where they were present in numbers, mostly dead or dying, around the base of a large picture window. Numerous wasps, presumably of the same species, were also flying about foliage around the exterior of the building. All but one of the specimens collected were females. Dr. Yoshimoto called attention to the fact that the endemic Hawaiian crabronids recently have been placed in the genus *Ectemnius* Dahlbom by the European hymenopterist Leclercq (MONOGRAPHIE SYSTEMATIQUE, PHYLOGENETIQUE ET ZOOGEOGRAPHIQUE DES HYMENOPTERES CRABRONIES, University of Liege, 1954).

JUNE 9, 1958

The 630th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, June 9, 1958, with President Tuthill in the chair.

Members present: Adachi, Awai, Balock, Beardsley, Bess, Bianchi, Boyle, Burditt, Carter, Clagg, Chong, Ford, Gressitt, Hardy, Hinckley, Holloway, Joyce, Kajiwara, Kamasaki, Keck, Keiser, Kimoto, Look, Lukins Maeda, McGee, McMahan, Mourikis, Nakata, Namba, Nishida, Pemberton, Quate, H. I. Rainwater, Rosa, Sherman, Steiner, Suehiro, Toba, Tuthill, Wilton, and Yoshimoto.

Visitors: Mr. Y. Elikewela of Ceylon; Mr. Alan May of Queensland, Australia; and Messrs. T. Dano, Harahap, A. Nasution, Nazar, Soedarono, Widarmoko, and Wimbarjono, all of the Republic of Indonesia.

Dr. J. L. Gressitt was elected to represent the Society at the Colloquim on Zoological Nomenclature which is to be held in London during July of this year, prior to the opening of the Fifteenth International Congress of Zoology.

Mr. Alan May of the Queensland Department of Agriculture and Stock gave a most informative talk on entomological problems and insect control work in Queensland, Australia.

NOTES AND EXHIBITIONS

Scyphophorus acupunctatus Gyllenhal: Mr. Bianchi exhibited an adult specimen of this large weevil which he had reared from and *Agave* plant growing on the seaward side of Diamond Head, Oahu. Only one larva was found in the spindle of the plant and the growing point had not been destroyed, but many leaves had been injured and made unsightly by the feeding of the insect. This is the first report of the weevil in several years, and it shows remarkable persistence of the species in spite of the scarcity of its host plant.

Pseudaletia unipuncta (Haworth): Mr. Bianchi stated that on May 21, 1958, he had been called to observe an extensive infestation of this armyworm on the Kahua Ranch, in the Kohala District of Hawaii. At the time only full-grown or nearly full-grow catepillars were found, together with numerous pupae and some moths. The only host plant involved was kikuyu grass. The manager of the ranch informed him that something over 500 acres of paddock were presently devastated by the pest, and that during January a much smaller acreage had been similarly affected at the same time that another small infestation had appeared on the Kukaiau Ranch, forty miles away on the Hamakua Coast. Excepting two tachinid larvae which were attached to the remains of a caterpillar, no parasites or predators were seen during a two hour search. Discreet nuclei of polyhedrosis disease were numerous and widespread throughout the infested area, however, and had obviously caused heavy mortality among the caterpillars. Other armyworms, which might be expected in abundance at this time because of the weedy condition of the cane fields which has resulted from the recent sugar strike, have not been reported by any plantation.

Crossopalpus insularis (Melander): Miss Adachi reported that recently she had found a specimen of this empidid fly in the Bernice P. Bishop Museum which had been collected at Tutuila, Samoa, July 14, 1953, by C. P. Hoyt. The fly was described from specimens collected on Oahu ("PROCEEDINGS" 14 (3) :419-420, 1952), and this is the first record of its occurrence outside of Hawaii.

Typhoon damage to Jaluit Atoll: Dr. Gressitt reported that at the end of May he had spent a week on Jaluit Atoll in the Marshall Islands, with a team that included five other specialists and a Trust Territory government official, studying the effects of Typhoon Ophelia which struck there on January 7, 1958. Colored slides were shown which illustrated the severe damage inflicted by the typhoon. Some islets had had the vegetation largely eliminated, with most of the soil washed away or covered with coral rubble. Other islets were much less severely damaged.

Possibly no species of insects were exterminated from the atoll as a whole, but on some islets rather few species were found, and repopulation by certain species must follow revegetation. Soil insects, grasshoppers, scale insects, and some fragile forms seem to have suffered most severely. *Culex* mosquitoes were plentiful, and leafhoppers and some moths were breeding in large numbers on new growth, suggesting that their natural enemies suffered more than they did.

Kunzeana kunzei (Gillette): Mr. Beardsley reported that he had found this immigrant cicadellid leafhopper at Mapulehu, Molokai, on June 5th. This is a new island record for the species which previously has been known in Hawaii only from Oahu. Adults and nymphs were plentiful on the foliage of *Acacia farnesiana* (L.) Willd., and numerous adults but no nymphs were found on foliage of *Leucaena glauca* (L.) Benth. The latter is a new host record for the leafhopper.

JULY 14, 1958

The 631st meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, July 14, 1958, with President-elect Nishida in the chair.

Members present: Balock, Beardsley, Bess, Bianchi, Boyle, Burditt, Christenson, Clagg, Chock, Chong, Haramoto, Hardy, Hirst, Holloway, Joyce, Kajiwara, Kamasaki, Keiser, Kim, Look, Macdougall, Maehler, McGee, McMahan, Mourikis, Namba, Nishida, Ota, Pemberton, Quate, D. Rainwater, H. I. Rainwater, Sherman, Steiner, Suehiro, Tamashiro, Toba, Thistle, Wilton, Woolford and Yoshimoto.

Visitors: Mr. I. Cohen, Mr. V. Elikewela, Mr. John Fenn, Mr. E. T. Kawamoto, Mr. Stanley T. Lee, Mr. G. Matsuoaka, Dr. A. R. Mead, Mr. and Mrs. A. J. Michelmore, Mr. D. J. Nadel, and Mr. C. M. Wheeler.

The Secretary read a letter addressed to the Society announcing the Eleventh International Congress of Entomology which is to be held in Vienna, from August 17 to August 25, 1960. The letter requested interested persons to contact the secretary of the Congress, Vienna I., Burgring 7, as soon as possible, and was signed by Dr. Max Beier, Secretary-General.

The Secretary read a second letter from Dr. H. M. Armitage, addressed to Dr. Walter Carter, concerning the Harry Scott Smith Memorial Fund to Advance the Science of Biological Control. Dr. Armitage requested that the proposed memorial fund be brought to the attention of the Society.

Mr. Alan Thistle showed a very interesting motion picture on the giant African snail and its enemies in Hawaii which had been prepared by the Territorial Board of Agriculture and Forestry.

Notes and Exhibitions

Hermetia illucens (L.): Mr. Balock reported that Mr. Robert Iversen of the Pacific Oceanic Fisheries Investigations laboratory had found this stratiomyid fly breeding in covered ten-gallon earthenware crocks containing stomachs and gonads of tuna enclosed in muslin sacks and preserved in a solution of approximately 10% formaldehyde. Large numbers of live and dead larvae, pupae, and some dead adults of the fly were found in crocks in which tuna remains were not completely submerged, but where the muslin and contents were, nevertheless, moist and apparently impregnated with the preservative.

Pseudaletia unipuncta (Haworth): Mr. Bianchi referred again to the infestation of *Pseudaletia* which he had spoken of at the last meeting, stating that he had visited Kahua Ranch a second time on June 23. At the time of this visit the area devastated had not increased, although the pasture originally damaged did not show signs of recovery. Caterpillars had disappeared completely from some areas and had become generally scarce, while pupae and adult moths had increased somewhat, but not, to judge from casual observation, to the number that might have been reasonably expected at the height of the infestation. The polyhedrosis disease, abundant in May, had apparently run its course and was not in evidence, but two parasites, the ichneumonid *Pterocormus laetus* (Brullé) and the tachinid *Eucelatoria armigera* (Coquillet), were now found where none had been seen before. The first of these could be found in dozens, which is unprecedented abundance for the species; and the second in hundreds, which was not uncommon abundance in the days when *Eucelatoria* was one of the principal parasites of *Spodoptera exempta* (Walker) in the cane fields.

No other parasites were seen out of a long list of them which are known to parasitize *S. exempta, S. mauritia* Boisduval, and other relatives of *Pseudaletia.* This observation led Mr. Bianchi to suggest that it might be advisable to introduce *Apanteles militaris* (Walsh) into Hawaii. This braconid is known to exercise a strong control over the pest in Tennessee and other areas of the Mainland, and might have the same effect here. There is a record of the introduction of *A. militaris* from Mexico in 1924 (Williams, F. X.; Insects and Other Invertebrates of Hawaiian Sugar Cane Fields p.375, 1931), but there is strong reason to believe that the insect was not, in fact, *A. militaris,* and that the introduction of the true *A. militaris* should be attempted.

Dr. Joyce presented the following notes:

Anisopus sp.: A single specimen of a fly of this genus was taken in a light trap at the Public Health Service Quarantine Station near Pier 1 in Honolulu, on May 21, 1958. The family Anisopidae, of which this genus is the type, has been previously unrepresented in the Hawaiian fauna. Flies of this group are closely related to the Tipulidae, but differ in that ocelli are present and the V-shaped mesonotal suture is lacking. The specimen taken had distinctly mottled wings, and, although damaged, was readily placed in the genus *Anisopus* by the characteristic wing venation. Larvae of the Anisopidae are usually found in wet decaying organic matter such as cow dung, fermenting potatoes, decaying roots and fermenting sap in tree holes.

Lygus elisus (Van Duzee): The pale legume bug was first discovered in Hawaii in July of 1947 ("PROCEEDINGS" 13 (2) :212, 1948) when it was found to be abundant in the Iriquois Point area at Pearl Harbor. Little has been heard of this species in Hawaii since that time. A specimen was taken in a light trap at the P.H.S. quarantine station in Honolulu on June 20, 1958, which indicates that the species is still present and has extended its range.

Batocera lineata Chevrolat: A dead specimen of this conspicuous cerambycid beetle was picked up on June 3, 1958, in front of the Public Health Quarantine area at the Honolulu Airport. It is assumed that the beetle must have come from one of the recent aircraft arrivals from Japan since the species is common in that country.

Dermacentor variabilis (Say): Two lots of the American dog tick were referred to me by Dr. Willers, Territorial Veterinarian, for identification. The ticks were taken from dogs detained at the Animal Quarantine Station. One dog was imported from Greenwich, Connecticut on June 17, 1958, and the other from New Jersey on June 27, 1958. Both male and female ticks, some of which were fully engorged, were recovered. This tick is not known to be established in Hawaii but is common in the United States east of the Rocky Mountains, and ranges from Alaska to Mexico. It is a vector of Rocky Mountain spotted fever, tularemia, anaplasmosis, and may cause tick paralysis. It is important that such infestations be detected and controlled while dogs are being held in quarantine to help prevent this tick from becoming established here.

Ceroplastes cirripediformis Comstock: A note concerning the identity of this coccid was presented by Mr. Maehler for Mr. Chilson. This species was first reported in Hawaii by Sherman in 1953 ("PROCEEDINGS" 15 (2) : 271, 1954), on the basis of a tentative identification by Dr. Harold Morrison. Later, Dr. Hardy stated that he had information indicating that *C.*

cistudiformis Townsend and Cockerell was the correct name for this insect ("PROCEEDINGS" 15 (3) :379, 1955). The Plant Quarantine Division interception records of this scale show that in 1953 Dr. Morrison was tentatively calling it *C. cistudiformis.* However, since 1954 he has been using the phrase "I think is *Ceroplastes cirripediformis* Comst.". It would seem therefore, that *C. cirripediformis* should be used in future references to Hawaiian specimens. In addition to the previously reported hosts; *Duranta repens* ("PROCEEDINGS" 15 (3) :386, 1955), *Schinus terebinthefolius* ("PROCEEDINGS" 16 (1) :3, 1956), and *Passiflora;* scales have been collected on *Argyreia nervosa* (Burm.) Bojer by K. L. Maehler in June, 1958; on *Philodendron* by J. H. Gayden, Oct. 14, 1956; on *Pimenta officinalis* Lindl. by L. M. Chilson, July 8, 1956; and in Kailua, Oahu on *Passiflora* by Chilson on July 1, 1958. This last record is a new locality for the scale which has been known previously in Hawaii only from the vicinity of Honolulu.

New names for two Hawaiian Ichneumonidae: Dr. Pemberton reported that in Dr. Henry Townes' treatment of the Ichneumonidae of Micronesia (INSECTS OF MICRONESIA 19 (2) :35-87, 1958) the following two name changes which apply to Hawaiian ichneumonids should be noted: on page 42, *Echthromorpha fuscator* (Fabricius) is given the new status of *Echthromorpha agrestoria fuscator* (Fabricius); and on p. 66, *Zaleptopygus* (*Cremastus*) *flavo-orbitalis* (Cameron) is given the new combination *Trathala flavo-orbitalis* (Cameron).

Cottony-cushion scale and Rodolia beetles in the Marshall Islands: Mr. Beardsley reported that infestations of the cottony-cusion scale, *Icerya purchasi* Maskell, had been discovered recently at two new localities in the Marshall Islands, and on Wake Island. This insect was first found in the Marshalls at Eniwetok in July, 1957 by L. D. Tuthill ("PROCEEDINGS" 16 (3) :333, 1958). In June of this year it was found infesting *Casuarina* trees at Kwajalein, and at Uliga, Majuro Atoll, by Mr. R. P. Owen, entomologist for the Trust Territory. Mr. Owen has attempted to eradicate the pest at Majuro, but the infestation at Kwajalein was deemed too extensive to warrant an attempt at eradication. *Icerya purchasi* was collected for the first time at Wake Island in November, 1957, by Mr. Krauss. The scales were determined by Mr. Beardsley.

At Kwajalein Mr. Owen found two species of *Rodolia* beetles present. These were *R. pumila* Weise, which he found feeding on *Icerya aegyptiaca* (Douglas), and *R. breviuscula* Weise, which was feeding on *I. purchasi.* The beetles were determined by Dr. E. A. Chapin. *R. pumila* was first introduced into Kwajalein in 1949 to combat *I. aegyptiaca.* There are no recorded introductions of *R. breviuscula* into Kwajalein. However, the species reported to have been introduced into Guam and Majuro from India in 1948, which was tentatively identified as *R. fumida* Mulsant (see "PROCEEDINGS" 15 (3) :397, 1955), was actually *R. breviuscula* accord-

ing to Dr. Chapin. Presumably, *R. breviuscula* was either accidentally or purposely introduced to Kwajalein from Guam or Majuro. This is the first record of the establishment of *R. breviuscula* in Micronesia.

August 11, 1958

The 632nd meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, August 11, 1958, with President Tuthill in the chair.

Members present: Balock, Beardsley, Bess, Bianchi, Boyle, Burditt, Carter, Chilson, Holloway, Kajiwara, Kamasaki, Kimoto, Look, Maehler, McMahan, S. Mitchell, W. Mitchell, Mourikis, Namba, Ota, Pemberton, Quate, Sakimura, Steiner, Suehiro, Toba, Tuthill, Wilton, Woolford, and Yoshimoto.

Visitors: Dr. George W. Byers, Mrs. H. A. Woolford, and Miss Carole J. Worthington.

Miss Carol Worthington was nominated to membership in the Society.

Dr. George W. Byers of the Entomology Department of the University of Kansas gave an interesting account of the entomologists and current entomological research at that institution.

Notes and Exhibition

Cheiracanthium diversum Koch: Mr. Bianchi exhibited a specimen of this spider which had been sent to him from a business address in downtown Honolulu, with word that it had bitten a woman on Chun Hun Lane while she was hanging garments on a clothes line. The woman was bitten on the right hand at the base of the thumb on July 30th, and had been attended at the City Emergency Clinic immediately, but the pain had not subsided overnight and had required further medical attention the next day.

Bishop Museum Entomology Department activities: Dr. Quate reported on the whereabouts of various entomologists now working on projects of the Bishop Museum Entomology Department. These include Dr. Elizabeth Marks, who recently completed a trip to New Guinea where she concerned herself principally with the collection of mosquitoes; Mr. Boris Malkin, who has been in New Caledonia and is now in the New Hebrides; Dr. H. E. Milliron, who has been on Palawan and is now on Mindanao in the Philippines; and Mr. T. C. Maa, who has been in Sarawak. Dr. Gressit has completed his work in London, where he at-

tended the Fifteenth International Congress of Zoology, and is now in Paris. He will be in Europe until the end of this month and will then proceed to Calcutta and Bangkok.

Trapping air-borne insects: Dr. Yoshimoto exhibited an experimental insect trap the design of which is based on the principal of the wind-sock. This trap was exposed on the roof of the Bishop Museum for twelve consecutive days during late July and early August. Specimens captured in the trap during that period were examined and determined as follows: *Camponotus maculatus* Forel (16 specimens); unidentified ants (3 specimens); scolytid beetle (1 specimen); elytra of scolytid beetles (2 specimens); *Geotomus pygmaeus* (Dallas) (1 specimen); lygaeid bug, probably *Nysius* sp. (1 specimen).

Mr. Chilson presented the following two notes:

Diaspidid scales from Mondo japonicum (L.) Farw.: The paper by G. F. Ferris ("PROCEEDINGS" 16 (2) :212, 1957) in which he described *Pinnaspis caricis* from *Mondo* appears to be the first report of an insect attacking that host in Hawaii. On September 26, 1955, only a month after the initial collection of *P. caricis* in Honolulu, Inspectors E. H. Davidson and H. Sekomoto found specimens of this scale on *Mondo japonicum* in Hilo, Hawaii. In addition, they collected *Parlatoria proteus* (Curtis) and *Chrysomphalus dictyospermi* (Morgan) from the same host material. All the scales were determined by Dr. Harold Morrison. This constitutes a new host record for the latter two scales, and a new island record for all three.

New ant records for Palmyra Island: Mr. Krauss' paper on the insects and other fauna of Palmyra ("PROCEEDINGS" 15 (1): 217–220, 1953) lists only one species of Formicidae, determined as *Pheidole* sp. To this may be added *Tetramorium guineense* (Fabricius) and *Paratrechina longicornis* (Latreille). *Pheidole megacephala* (Fabricius) was also taken, this no doubt being the species found by Krauss. These ants were collected by E. J. Ford on some sprouted coconuts brought to Honolulu from Palmyra on April 13, 1957.

The following notes were presented by Mr. Beardsley.

Ripersiella sp.: During June of this year specimens of a hypogeic mealybug belonging to this genus were collected on the roots of *Peperomia leptostachya* Hooker and Arnott at about 500 feet elevation along the Wiliwilinui Ridge Road, Oahu, and from the same host at about 2,000 feet elevation on the Palikea Trail in the Waianae Mts., Oahu. These are the first records of a mealybug of this genus in the Territory. However, the species may be the same as *Radicoccus hawaiiensis* Hambleton, which is known only from a single collection from *Coleus* roots, Manoa

Valley, Oahu, 1918. Dr. Harold Morrison has compared the *Ripersiella* specimens with the two specimens of *R. hawaiiensis* in the U.S. National Coccid Collection and found them very similar except for the presence of eyes in my specimens. Since the eyes are very small and difficult to see in my most strongly stained specimens, it is possible that they would not be discernible in poorly stained or faded specimens. The presence or absence of eyes is used by Hambleton (Rev. de Entomologia 17 (fasc. 1–2) :1–77, 1946) to separate the genera *Ripersiella* and *Radicoccus*.

Ceroplastes cirripediformis Comstock: This immigrant coccid recently has spread into the Marshall Islands where it was collected by L. D. Tuthill at Eniwetok during July, 1957, on *Pseuderanthemum;* and by R. P. Owen at Kwajalein in June of this year, on *Coccolobis*. The species was described from North America.

Plagiolepis alluaudi Emery: Attention was called to a paper by M. R. Smith (Jour. New York Ent. Soc. 65:195–199, 1957) in which the ant *P. mactavishi* W. M. Wheeler is reduced to a synonym of this species. This ant occurs in Hawaii and has previously appeared in our literature as *P. mactavishi*.

September 8, 1958

The 633rd meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, 2:00 P.M. on Monday, September 8, 1958, with President-elect Nishida in the chair.

Members present: Balock, Beardsley, Bess, Bianchi, Burditt, Chilson, Chong, Davis, Ford, Fullaway, Hardy, Holloway, Joyce, Kajiwara, Kamasaki, Keck, Kimoto, Lukins, Maehler, McMahan, S. Mitchell, Mourikis, Nakata, Namba, Nishida, Ota, Pemberton, Quate, Sherman, Steiner, Suehiro, Tamashiro, Thistle, Wilton and Yoshimoto.

Visitors: Dr. George D. Butler, Mr. Bernard B. Sugerman, and Miss Carole J. Worthington.

Dr. Butler, Mr. Sugerman, and Mr. Teichi Yamada of the USDA Fruit Fly Laboratory on Maui were nominated for membership in the Society. Miss Carole Worthington was elected to membership.

By a vote of the members present it was decided that the Society would become a dues-paying member of the Conservation Council for Hawaii. Dr. Nishida appointed Drs. D. E. Hardy and C. E. Pemberton to serve as the Society's representatives on the Conservation Council.

Mr. C. J. Davis of the Territorial Board of Agriculture and Forestry gave a very interesting account, illustrated with Kodachrome slides, of his recent trip through England, Portugal, Spain, and North Africa in search of enemies of Hawaiian rangeland weed pests, principally gorse.

Notes and Exhibitions

Palorus foveicollis Blair: Mr. Ford reported that specimens of this tenebrionid beetle (see Kulzer, H.; Ins. Micronesia 17 (3) :219, 1957) from Oahu had been identified for him by Mr. T. J. Spilman of the U. S. National Museum. The species had been determined previously by Dr. E. A. Chapin as "genus near *Palorus* sp." ("Proceedings" 13 (3) :323, 1949). It was first collected in Hawaii in a light trap at Iroquois Point, Oahu, in November 1947. Additional specimens were collected at Barber's Point, Oahu, during 1949, and from light traps at Ewa and Waipio, Oahu, during 1957. The known distribution includes Ceylon, Philippines, Guam, and Hawaii. It has also been taken in grain from Trinidad, and Mobile, Alabama, according to U.S.N.M. records.

Acinopterus angulatus Lawson: Mr. Beardsley reported that a single female specimen of a cicadellid leafhopper which he has tentatively identified as this species (Kansas Univ. Science Bull. 14 (4) :119–120, 1922) was taken in an HSPA light trap at Ewa, Oahu, on August 25, 1958. This species is known from California, Southwestern U.S., Mexico, Central America, and the West Indies. Severin (Hilgardia 17 (5) :197–211, 1947) found this leafhopper to be a vector of aster-yellows virus in experimental studies in California. Delong and Severin (Hilgardia 17 (5) :212–215, 1947) discuss the taxonomy, distribution, and host plants of this species, and conclude that the preferred host plants in California are legumes. These authors cite collection record from alfalfa (*Medicago sativa* L.), Spanish clover (*Lotus americanus* Vell.), and wild licorice (*Glycyrrhiza lepidota* L.).

Phenacoccus gossypii Townsend & Cockerell: Mr. Beardsley reported collecting this immigrant mealybug on *Sophora chrysophylla* (Salisbury) Seemann and on *Myoporum sandwicense* (A. de Candolle) Gray at Pohakuloa, Hawaii, during August of this year. This constitutes a new island record and two new host records for the species.

Spodoptera mauritia (Boisduval): Mr. Tamashiro reported that he had collected egg masses of this noctuid moth at Waihee, Maui, late in August of this year. No adults were found, but larvae reared from the egg masses were positively identified as *S. mauritia*. This is a new island record for the species.

False spider mites in Hawaii: Mr. Chilson called attention to a recent revision of the mite family Tenuipalpidae, or false spider mites, by A. E. Pritchard and E. W. Baker (Univ. Calif. Pubs. in Ent. 14 (3) :175–274, 1958). Five species of this family previously have been reported from Hawaii. Pritchard and Baker add two new records to our fauna, and make changes in nomenclature which affect several of the previously

recorded names. Following is a list of the species now known to occur in Hawaii. (1) *Brevipalpus lilium* Baker. Pritchard and Baker list this species from Oregon, Washington, California, Florida, and Hawaii, on a number of hosts. This is a new record for the Territory. (2) *Brevipalpus californicus* (Banks). This is a widespread species which has been reported from many hosts. It was first recorded in Hawaii by Boyle ("PROCEEDINGS" 16 (2) :196, 1957) as *B. australis* Tucker, considered to be a synonym of *B. californicus* by Pritchard and Baker. (3) *Brevipalpus obovatus* Donnadieu. This is a pest species of wide distribution. *Tenuipalpus inornatus* Banks, *Brevipalpus inornatus* (Banks), and *Tenuipalpus bioculatus* McGregor are among the synonyms listed by Pritchard and Baker. It was first recorded from the Territory (as *B. bioculatus*) by McGregor ("PROCEEDINGS" 9 (3) :337, 1937). (4) *Brevipalpus phoenicus* (Geijskes). Previously recorded Hawaiian host records of this species are papaya, *Passiflora*, and puncture vine ("PROCEEDINGS" 16 (1) :19). Plant Quarantine Division inspectors have taken it on orange, lemon, and *Bryophyllum* sp. on Oahu, and on *Arundina bambusifolia* Lindl. at Hilo. These collections were determined by E. W. Baker. (5) *Dolichotetranychus vandergooti* (Oudemans). This species is listed from the Canal Zone, Siam, Java, Philippine Islands, and Hawaii, on *Dendrobium* and *Arundina*. The record, which is a new one for Hawaii, appears to be based on a collection of mites from *Arundina bambusifolia* at Hilo, February 9, 1953, which were determined at that time as *"Dolichotetranychus* sp." by Baker. (6) *Dolichotetranychus floridanus* (Banks). This mite, known to have been present here since 1908, has appeared previously in our literature as *Stigmaeus floridanus* Banks ("PROCEEDINGS" 5 (1) :32, 1922). The species is also known from Florida, some West Indian and Central American areas, the Philippines, Java, and Japan. Pineapple is the only known host. (7) *Tenuipalpus pacificus* Baker. This species was first recorded from Hawaii on the basis of specimens identified by Dr. Baker ("PROCEEDINGS" 15 (3) :377, 1955), but the Hawaiian record is not cited in the Pritchard and Baker paper.

OCTOBER 13, 1958

The 634th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, October 13, 1958, with President-elect Nishida presiding.

Members present: Beardsley, Bess, Bianchi, Burditt, Butler, Carter, Chilson, Chock, Chong, Davis, Fullaway, Hardy, Hinckley, Holloway, Ito, Joyce, Kamasaki, Kim, Kimoto, W. Mitchell, Mourikis, Nakata, Nishida, Pemberton, D. Rainwater, Sherman, Suehiro, Thistle, Wilton, Woolford, Worthington, and Yoshimoto.

Visitor: Mr. Earnest Yoshioka.

Dr. Butler, Mr. Bernard Sugerman, and Mr. Teichi Yamada were elected to membership in the Society.

Notes and Exhibitions

Tefflus zanzibaricus alluaudi Stenberg: Mr. Thistle exhibited a living adult specimen of this large carabid beetle which was recovered near Halekou Road in Kaneohe, Oahu, during September of this year. This species is predaceous upon snails, and was released during 1952–53 to combat the giant African snail. This is the first live recovery of *T. zanzibaricus* since 1953.

Fruit fly host records: Dr. Burditt presented the following information concerning new and unusual fruit fly host records:

"Two new host records for the Oriental fruit fly, *Dacus dorsalis* Hendel, were reported by Mr. Nakagawa from Hawaii during July. Twenty-four green sapote (*Calocarpum viride* Pittier) fruits collected at the Kona Experiment Station in June yielded 159 fly pupae from which emerged 1 Oriental fruit fly, 73 Mediterranean fruit flies, and 13 *Opius oophilus* Fullaway. Seventy-three fruits of acerola or Barbados cherry (*Malpighia punicifolia* L.) collected at Opihikau, Hawaii, produced 83 puparia from which 57 Oriental fruit flies and 5 *O. oophilus* emerged. Mr. Chilson has reported that acerola cherries offered to the public at the Kaneohe Fair on Oahu during August were found infested with *D. dorsalis* larvae by Mr. G. Pearsoll of the USDA Plant Quarantine Division.

"High field infestation of bell peppers on Maui by Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann), has been reported by Mr. Yamada. Ninety picked fruits (¼ ripe to ripe) produced 179 flies; 90 ripe ground fruits yielded 23 flies; and 9 green culls (cracked and bruised) produced 19 flies. Although listed as an occasional host by Back and Pemberton (USDA Bull. 536:25–26, 1918) no *C. capitata* have been reared from 6,067 fruits field-collected on Maui since 1949, nor on Oahu from 5,994 fruits collected between 1949 and 1953. However, most of these collections came from areas well apart from detectable medfly infestations. The current high infestation is believed to be associated with heavy build-up in peaches and the termination of the peach crop. Tomatoes, normally infested by the melon fly and occasionally by the Oriental fruit fly, were also found infested by the Mediterranean fruit fly following the loquat season with its high population build-up. Collections at Kula, Maui in April produced 92 *C. capitata* from 1,300 ripe fruits. A later collection of 1,000 mature-green fruits yielded only one fly."

Frankliniella sulphurea Schmutz: Dr. Carter reported for Mr. Sakimura that a thrips which he had identified as this species was the cause of several complaints of annoyance by residents of the Aliamanu and

Ainakoa sections of Honolulu, the persons complaining having been bitten by the thrips. Mr. C. J. Davis reported that the same species of thrips (determined by Mr. Bianchi) was found by him to be the cause of a complaint of a resident of Nanakuli, Oahu. Both Mr. Sakimura and Mr. Davis found that large populations of this thrips had developed in the flowers of certain wild plants, particularly *Leucaena glauca*, and that the thrips apparently had migrated into adjacent residential areas when drought conditions which prevailed during the latter part of September caused the wild hosts to dry up. Mr. Bianchi stated that he has been bitten by thrips on many occasions, and that Herms refers to thrips attacking man in the United States and elsewhere in his book MEDICAL ENTOMOLOGY.

Heliothis virescens (Fabricius): Mr. Davis reported that he had reared this noctuid moth from the fruit of *Passiflora foetida* L. collected near Waipahu, Oahu on September 16th. This is a new Territorial host record for the species.

Insect parasites of birds: Mr. Fullaway stated that Dr. Gootch, Territorial Veteranarian, had recently found specimens of the stick-tight flea, *Echidnophaga gallinacea* (Westwood), infesting a nene goose at Pohakuloa, Hawaii. Dr. Gootch also collected specimens of a mallophagan louse (*Myrsidea* sp.?) on a stork in the Honolulu Zoo.

Pycnoscelus surinamensis (L.): Mr. Bianchi read a letter from Dr. Louis M. Roth, entomologist with the Research and Engineering Command, U.S. Army, Natick, Mass., in which Dr. Roth stated that specimens of this cockroach sent to him from Hawaii some months ago had all turned out to be of the minor or short-winged race. This information gives rise to the question of whether both minor and major races of the species are present in Hawaii.

Hedylepta accepta (Butler): Mr. Bianchi stated that he had recently observed in a cane field near Mountain View, Hawaii, a paralyzed larva of the sugar cane leafroller stuck to a cane leaf by means of a few threads and bearing exteriorly and ventrally near the anterior prolegs, five small, transluscent eggs. This find is not in accordance with the habits of any known parasite of *Omiodes*, and it may indicate the presence in the Territory of an unrecorded parasite, or the unrecorded habit of some faculatative parasite which normally attacks some other host.

Hylaeus stevensi Crawford: Mr. Beardsley exhibited a female specimen of this hylaeid bee (CANAD. ENT. 45:155, 1913) which he had collected on legume flowers at Ewa, Oahu, on Sept. 30th. A male specimen collected at the same locality on Sept. 22nd was sent to Mr. P. H. Timberlake at the University of California, Riverside, who identified it as this species.

This is a North American bee known from North Dakota to Idaho, Utah, Colorado, and California. Mr. Timberlake stated that he has taken the species occasionally at Riverside. It appears to be a newly established immigrant here.

The following notes were submitted by Mr. Chilson:

Diploptera punctata (Eschscholtz). Dr. A. B. Gurney has informed us that *Diploptera dytiscoides* (Serville), the name by which our cypress cockroach has been long known, has been reduced to a synonym of this species by K. Princis (OPUSCULA ENTOMOLOGICA 15:162, 1950).

Araecerus levipennis Jordan. This anthribid beetle was found by E. B. Lee in *Leucaena glauca* pods mailed from Molokai on June 17, 1958. This is a new island record.

Dialeurodes kirkaldyi (Kotinsky). Mr. G. Sadoyama collected this aleyrodid on *Plumeria acuminata* Alt., on January 10, 1958. Specimens were determined by Miss L. M. Russell. This is a new host record for the whitefly in the Territory.

Ceroplastes cirripediformis Comstock: The ornamental border plant known as "shoo-fly", *Alternanthera amoena* (Lem.) Voss, is a new Hawaiian host for this scale. It was collected on that plant by J. Gayden on September 25, 1958, at Foster Village, Oahu.

New mite records: Two species of mites belonging to the predaceous family Cheyletidae which are new to the Territory were collected recently on Oahu. *Cheletophyes hawaiiensis* Baker (PROC. U. S. NAT. MUS. 99:289, 1949) was described from specimens collected on Oahu, but has not been recorded previously in these "PROCEEDINGS". Mr. Chilson collected this species from *Morinda citrifolia* L. on May 6, 1958. *Cheletogenes ornatus* (Canestrini & Franzago), which was redescribed by Baker in 1949 (*ibid.* 305–306), was collected on *Ficus* sp. on October 30, 1957. Both lots of mites were determined by Dr. Baker.

NOVEMBER 10, 1958

The 635th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, November 10, 1958, with President-elect Nishida in the chair.

Members present: Beardsley, Bess, Burditt, Butler, Chilson, Fullaway, Hardy, Hinkley, Kamasaki, Keiser, Kim, Look, Maehler, S. Mitchell, W. Mitchell, Nakata, Nishida, Ota, Pemberton, Sherman, Steiner, Suehiro, Sugerman, Tamashiro, Thistle, Wilton, Worthington, and Yoshimoto.

Visitors: Professor Hisuo Aruga and Mr. Moon Soon Im.

Mr. Sidney H. Blunt of Birmingham, England was nominated for membership in the Society.

Dr. Martin Sherman introduced the speaker of the afternoon, Professor Hisuo Aruga of the Faculty of Agriculture, Tokyo University. Professor Aruga delivered an informative talk concerning his studies in the fields of silkworm genetics and virus diseases of the silkworm.

Note and Exhibitions

Hypena jussalis Walker: Mr. Fullaway exhibited a specimen of this noctuid moth, the larvae of which feed on the foliage of lantana. The species was introduced into the Territory from Southern Rhodesia in June, 1957 by the Territorial Board of Agriculture and Forestry, and is now well established on Oahu and Hawaii.

Apion antiquum Gyllenhal: Adults of this weevil, the larvae of which bore in the stems of *Emex* spp., were also exhibited by Mr. Fullaway. The species was introduced from Durban, South Africa, and released on the Island of Hawaii in June, 1957. It is now reported to be established on the Parker Ranch by Mr. Harold Baybrook who has propagated the species in large numbers in a special *Emex* nursery.

The following notes were presented for Mr. Bianchi:

Thrips (Isoneurothrips) orientalis (Bagnall): Attention was called to the fact that the presence of this thrips (Ann. Mag. Nat. Hist. Ser. 8, vol. 15:593, 1915) in the Territory has not been previously recorded, although it has been mentioned in our meetings several times. The species was first found by Mr. Beardsley at Kaimuki, Honolulu, on January 12, 1956. At that time it was strikingly abundant on star jasmine flowers in several sections of the city, and it has remained common since then, although not as abundant as at first. The species was described from Sarawak, and is known in India and the Indo-Malayan region.

Tachypompilus analis (Fabricius): Two *Heteropoda* spiders parasitized by this psammocharid wasp were recently found by Mr. Bianchi at Lihue Plantation, Kauai, in a pan of Warfarin-rolled oats exposed as rat bait in a cane field. Oats so exposed are often rendered useless by a thick overlay of soil particles and small pebbles. This situation has always been suspected to result from the activity of the wasp, which is very often found near the bait pans. The find of the spiders provides hitherto unavailable evidence which corroborates the suspicion.

Anthrax distigma Wiedemann: This bombyliid fly was observed at Makua Beach, Waianae District, during the last week of September. Hitherto the species has been reported only from Honolulu.

December 15, 1958

The 636th meeting of the Hawaiian Entomological Society was held at the Experiment Station, HSPA, at 2:00 P.M. on Monday, December 15, 1958, with President-elect Nishida presiding.

Members present: Beardsley, Bess, Bianchi, Bryan, Burditt, Butler, Carter, Chilson, Chong, Clagg, Davis, Fullaway, Hardy, Hinckley, Joyce, Kamasaki, Keck, Kim, Kimoto, Look, Lukins, Maehler, S. Mitchell, W. Mitchell, Nishida, Ota, Pemberton, D. Rainwater, H. I. Rainwater, Sakimura, Sherman, Sugerman, Suehiro, Tamashiro, Worthington, and Yoshimoto.

The following officers were elected for 1959:

President	Toshiyuki Nishida
President-elect	C. R. Joyce
Secretary	W. C. Mitchell
Treasurer	J. W. Balock
Advisor	C. E. Pemberton

After some discussion, the members present voted to adopt amendments to the Constitution and By-Laws of the Society which would allow the creation of a standing Program Committee.

Drs. Walter Carter and D. E. Hardy presented interesting accounts of the sessions which each had attended at the Sixth Annual Meeting of the Entomological Society of America, held in Salt Lake City, December 1 to 4, 1958.

Note and Exhibitions

Sepedon macropus Walker: Mr. Fullaway exhibited specimens of this sciomyzid fly and presented the following note for Mr. Q. C. Chock. Two lots of *Sepedon* larvae were secured in October by the Board of Agriculture and Forestry from Dr. Clifford O. Berg, Assistant Professor of Limnology, Cornell University, for trial against the liverfluke snail, *Lymnaea ollula* Gould. The fly was originally obtained by Dr. Berg from Nicuragua. In the Board's insectary the predaceous *Sepedon* larvae readily attacked and consumed young *Lymnaea* snails, and third and fourth instar fly larvae also attacked full-grown snails. From a total of 25 adult flies reared from the larvae received from Dr. Berg, a local generation of more than 100 flies was obtained. The life cycle of the fly required approximately 22 days. Propagation of this fly is being continued and a small field release has already been made on Oahu.

Brachydeutera hebes Cresson: Mr. Davis exhibited adults and puparia of this ephydrid fly the larvae of which he found attacking and killing local populations of the liverfluke snail, *Lymnaea ollula* Gould. In pre-

liminary laboratory observations three out of 12 snails were killed by maggots of this fly. When one snail under attack was placed in a beaker of water six maggots were observed to leave it and float to the surface. In further laboratory studies in which a control of 10 adult *Lymnaea* was maintained, three additional snails were consumed over a period of three days. At the end of that time all the maggots had pupated. The duration of the pupal stage was seven days, and one hundred per cent emergence was obtained. No mortality was observed in the control snails. The larvae of *B. hebes* are said by Williams ("PROCEEDINGS" 10 (1) :99–99, 1938) to be preponderately scavengers in habit.

Hypena jussalis Walker: Mr. Davis reported that Mr. Stephen Au had found this noctuid moth, which was purposely introduced to combat lantana, established on the Island of Kauai. Mr. Au first noted *Hypena* activity on lantana at Lawai Valley on October 15th, and on November 7th noted that population was "exploding" in that area. Mr. Davis reported also that this moth had been found established on Maui at Haiku on November 13th. It was previously reported established on Oahu and Hawaii.

Changes in the names of Hawaiian Sarcophagidae: Dr. Hardy reported that in a recent publication on Micronesian Sarcophagidae (INS. MICRONESIA 12 (2) :15–49, 1958) H. de Souza Lopes has introduced new names for several species of flesh flies which occur in Hawaii. These changes are listed below.

Sarcophaga gressitti Hall and Bohart is corrected to *Phytosarcophaga* by Souza Lopes, p. 21.

Sarcophaga peregrina (Robineau-Desvoidy) is corrected to *Boettcherisca*, p. 29.

Sarcophaga orientaloides Senior-White placed in *Seriorwhitea*, p. 16

Sarcophaga knabi Parker placed in *Parasarcophaga*, p. 36.

Sarcophaga dux Thomson is placed as a synonym of *Parasarcophaga* (*Liosarcophaga*) *misera* (Walker), p. 41.

Sarcophaga argyrostoma (Robineau-Desvoidy) which was placed in the genus *Probellieria* by Dodge ("PROCEEDINGS" 14 (3) :478, 1952) is now placed in *Parasarcophaga* (*Thomsonea*), p. 45.

Sarcophaga ruficornis (Fabricius) is placed in *Parasarcophaga* (*Jantia*), p. 48.

Scadra sp.: Dr. Hardy reported that the unknown reduviid bug from Honolulu which he had exhibited at the October meeting had been identified by Dr. R. L. Usinger as *Scadra* sp., possibly *rufidens* Stål. A second specimen of what appears to be the same bug which was collected at Wahiawa, Oahu during September, by Mr. E. J. Ford, was exhibited to the membership.

Macrosiphum pisi (Harris): Dr. Hardy reported that this aphid (Palmer, M.S. APHIDS OF THE ROCKY MOUNTAIN REGION, Thomas Say Foundation, p. 320, 1952) was recently found infesting alfalfa at Ewa and Mokuleia, Oahu. This is the first record of the establishment of this aphid in the Territory. The species is a well known pest of legumes in North America and Europe. Specimens were identified by Miss Louise M. Russell of the U. S. Department of Agriculture.

Vedalia beetles sent to Kwajalein: Mr. Clagg reported that he had recently sent a shipment of about 150 adults of the Vedalia, *Rodolia cardinalis* (Mulsant), to the Naval Air Station at Kwajalein in the Marshall Islands in order to combat the cottony cushion scale, *Icerya purchasi* Maskell, which recently became established there. The beetles were reared and furnished by Mr. Beardsley.

Atrichopogon jacobsoni (de Meijere): Dr. Joyce reported that he had collected specimens of this biting ceratopogonid midge (TIJDSCHRIFT VOOR ENT. 50:212–213, 1907) in a light trap at Fort Armstrong, Honolulu during August of this year. This constitutes a new insect record for the Territory.

Episimus sp.: Mr. Beardsley exhibited specimens of this olethreutid moth which had been bred from catepillars found feeding on webbed-together leaves of Christmas berry (*Schinus terebinthifolius* Raddi) at Mapulehu, Molokai. The moths have also been plentiful in light trap catches from several localities on Oahu during the past several months. The establishment of this moth in the Territory has not been recorded previously in these "PROCEEDINGS", but records of the Territorial Board of Agriculture and Forestry indicated that it has been established for more than a year on the Islands of Oahu, Maui, Hawai, and Kauai. The species was purposely introduced into the islands from Brazil in 1954 to help combat Christmas berry.

On the Taxonomy of Pineapple Mealybugs in Hawaii, with a Description of a Previously Unnamed Species (Homoptera: Pseudococcidae)

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(Presented at the meeting of July 14, 1958)

The pineapple mealybug, *Dysmicoccus brevipes* (Cockerell), long has been recognized as one of the most important pests of agriculture in the Hawaiian Islands where for many years it has constituted the most serious insect problem of the pineapple industry (Carter, 1932, 1933; Zimmerman, 1948). Evidence now at hand indicates that two closely related but quite distinct species which have been confused under this name are present in Hawaii. Both these mealybugs occur on pineapple as well as number of other hosts, and one, retained here under the name *D. brevipes*, is also a minor pest of sugar cane.

Zimmerman (1948) reported the presence in Hawaii of an unidentified species of mealybug from several hosts other than pineapple and stated that the species might have been confused previously with *D. brevipes*. While in Washington, D. C., during 1957, I was able to examine the slide-mounted specimens upon which Zimmerman's records were based and to compare them with specimens which I had collected on several additional hosts. The credit for the discovery of the morphological characters which separate this species from *D. brevipes* belongs to Dr. Harold Morrison of the U. S. Department of Agriculture, Agricultural Research Service, who pointed out these differences to me. I am indebted to Dr. Morrison for many helpful suggestions and criticisms of the manuscript, and to Dr. Walter Carter, Pineapple Research Institute, Honolulu, who provided specimens of both *D. brevipes* and the species here described as new.

Dysmicoccus brevipes (Cockerell)

Dactylopius brevipes Cockerell, 1893:267, fig. 1.
Pseudococcus brevipes (Cockerell), Zimmerman 1948:189, fig. 105.
Dysmicoccus brevipes (Cockerell), Ferris 1950:59, fig. 19.

Balachowsky (1957) has recently considered in detail the morphology and systematics of the pineapple mealybug as it occurs in Martinique.

Since his concept of the species differs somewhat from that of Ferris (1948, 1950) is seemed desirable to re-examine Hawaiian specimens of *D. brevipes* in the light of Balachowsky's treatment. Balachowsky states that the presence of dorsal "glandes discoidales" (the "sieve pores" of Mamet, 1957) on abdominal segments seven to nine, and the presence of two small pores ("glandes préoculaires") at the base of each eye are constant characters of *D. brevipes*. These structures are not mentioned by Ferris. Balachowsky also states that the anal lobe cerarii as well as those of the seventh and eighth abdominal segments are borne on somewhat sclerotized areas. This is contrary to Ferris' statement that none of the cerarii are borne on sclerotized areas.

All Hawaiian specimens of *D. brevipes* which I have examined possess the peculiar small disc pores found by Balachowsky. These structures are present not only on the dorsum of the posterior abdominal segments, but generally scattered over the entire body on both dorsum and venter. The pores sometimes show a noticeable variation in size on different portions of the body, those of the dorsum of the posterior abdominal segments being the largest (about 6 μ maximum diameter). One to three such pores were found around the base of each eye in nearly every specimen examined.

The interpretation of the microscopic structure of these small disc pores is still subject to question. The pores were first described by Mamet (1957) in his *D. pseudobrevipes* as having a sieve-like structure, and his figures indicate a large number of small, irregularly-arranged loculi inside a well-defined rim. On the other hand, Balachowsky (1957) has shown them as small multilocular discs with a regularly loculate arrangement. In specimens which I have studied (highest magnification: X950, oil immersion) most of the larger discs of the dorsum of the posterior abdominal segments appear to be irregularly sieve-like. However, some of the smaller discs on the anterior portion of the dorsum sometimes show what seems to be a loculate structure similar to that illustrated by Balachowsky. The septa of these pores are so very fine that it is difficult to be entirely certain of their arrangement at the magnifications available. In the related species here described as new, a regularly loculate structure similar to that figured by Balachowsky seems to be present in at least some of these pores on nearly every specimen studied (fig. 1, 0). However, determination of the exact structure of these pores must await detailed histological study.

The apparent degree of sclerotizaton of the posterior cerarii of *D. brevipes* was found to be quite variable. Never were the cerarii borne on sharply defined and strongly sclerotized areas (such as those of the anal and penultimate cerarii of *Pseudococcus adonidum* (L.)). However, some evidence of sclerotization was evident on nearly every specimen examined. The degree to which this sclerotization was manifest appeared to depend primarily on the staining of the specimen. Freshly,

strongly stained specimens all showed some sclerotization, particularly of the anal cerarii. In weakly stained or faded specimens evidence of sclerotization was more difficult to see.

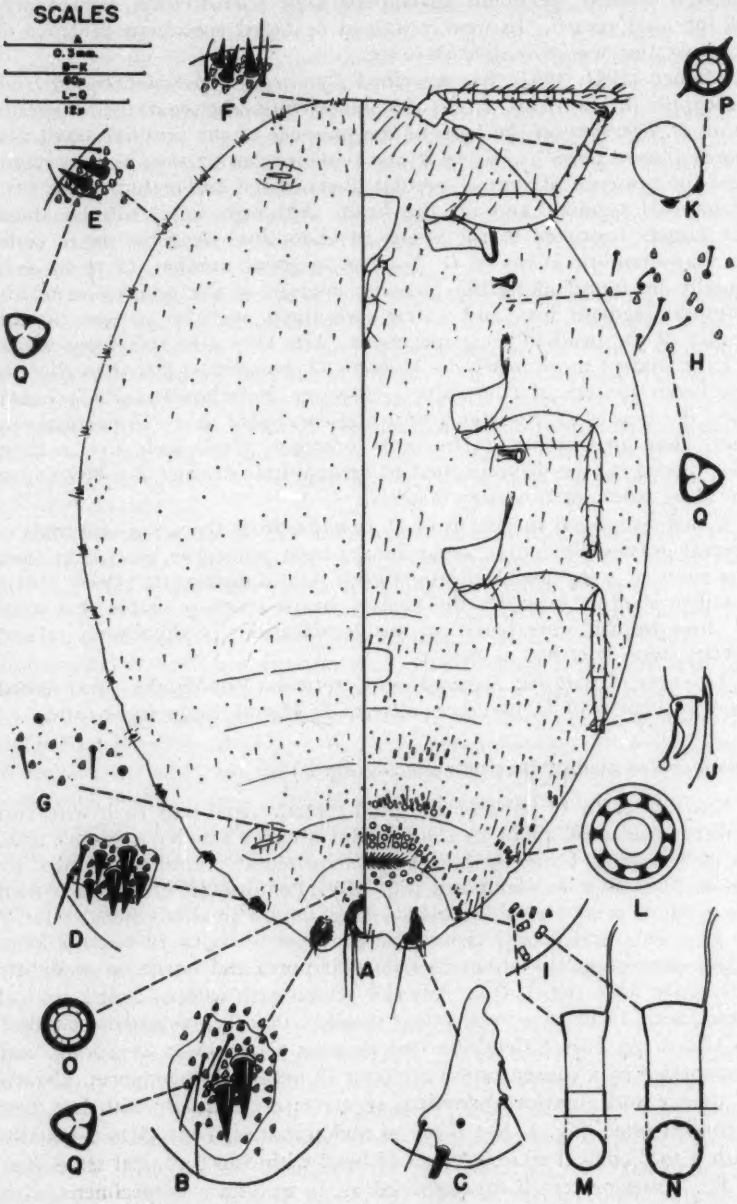
Mamet (1941, 1957) has described *Dysmicoccus pseudobrevipes* from pineapple in Mauritius. In his 1957 redescription he separated his species from *D. brevipes* on the basis of the presence of the peculiar small disc pores ("sieve pores"), the weak but evident sclerotization of the cerarii, and the presence of ventral tubular ducts in the mid-region of the fifth abdominal segment and on the head. Although small tubular ducts are largely restricted to the venter of abdominal segments six to eight in Hawaiian specimens of *D. brevipes*, a small number (2 to 6) may usually be found along the posterior margin of the mid-region of abdominal segment five, and a few such ducts are also present on the venter of the head in some specimens. The Hawaiian specimens which I have studied more nearly fit Mamet's *D. pseudobrevipes* than they do the Ferris concept of *D. brevipes*. However, Balachowsky (1957) examined the type of *D. pseudobrevipes* and concluded that it is probably no more than an extreme variant of *D. brevipes*. Until such time as these two species can be demonstrated to be definitely distinct, I prefer to use the older name for Hawaiian material.

I have examined specimens of *D. brevipes* from the stems and roots of several grasses (including sugar cane), from pineapple butts, and from the roots of a legume, *Melilotus indica* All. Zimmerman (1948) lists a number of other hosts for this species, but it seems probable that some of these records were based on misidentifications of the closely related species here described as new.

An encyrtid parasite, *Euryrophalus pretiosa* (Timberlake), was reared from specimens of *D. brevipes* collected in Honolulu on sugar cane.

Dysmicoccus neobrevipes, new species (fig. 1.)

Female. With 17 pairs of marginal cerarii. Anal pair each with two conical setae each about 24 μ long, plus about 6 slender accessory setae 15 to 30 μ long, borne on a slightly sclerotized area, and surrounded by about 40 to 50 trilocular pores (fig. 1,B). Penultimate cerarii each with two conical setae about 18 to 24 μ long, 1 to 5 smaller conical setae 9 to 12 μ long and 2 or 3 slender accessory setae about 20 to 24 μ long. These surrounded by about 25 trilocular pores and borne on a slightly sclerotized area (fig. 1, D.). Anterior cerarii each with at least 2 conical setae about 13 to 15 μ long, 0 to 4 smaller conical setae usually about 8 to 12 μ long, 2 or 3 slender accessory setae about 18 to 24 μ long, and surrounded by a concentration of about 12 to 20 trilocular pores. Cerarii of thorax and anterior abdominal segments each usually with but 2 or 3 conical setae (fig. 1, E); those of abdominal segments 5 to 7 usually with 4 to 6 conical setae. Cerarii of head with 3 to 6 conical setae (fig. 1, F). Anterior cerarii unsclerotized or, in well-stained specimens, with


SCALES
A
0.3 mm.
B–K
60µ
L–Q
120µ
F
P
K
E
I
H
Q
Q
J
G
L
D
A
I
O
Q
B
C
M
N

a narrow area of weak sclerotization immediately surrounding the bases of the conical setae.

Dorsum evenly, fairly densely scattered with trilocular pores. Small disc pores (fig. 1, O) sparsely scattered over entire surface; these usually 3 to 5 μ in diameter, but those of the mid-dorsal areas of abdominal segments 8 and 9 sometimes a trifle larger, with a maximum diameter of about 6 μ. Dorsal tubular ducts absent. Dorsum sparsely covered with short, spiniform setae, about 10 to 15 μ long, (fig. 1, G). Dorsum of posterior abdominal segments without longer setae. Two pairs of dorsal ostioles present.

Venter of each anal lobe with an elongate sclerotized area, two or more times as long as wide (fig. 1, C). About 30 to 50 multilocular pores of the normal pseudococcid type (fig. 1, L) present about the vulva on the venter of abdominal segments 8 and 9, plus about 6 to 20 additional along the posterior margin of abdominal segment 7. Small disc pores, of the type occurring on the dorsum, sparsely scattered over the entire venter. Two such pores present along the margin of each eye in most specimens (fig. 1; K, P). Tubular ducts confined largely to the venter of abdominal segments 6 to 8, these mostly small (about 3.5 μ diameter) (fig. 1; I, M); a few slightly larger ducts (about 4.8 μ diameter) present near the lateral margins on segments 6 to 8 in most specimens (fig. 1, I, N). Tubular ducts of both sizes with very slight oral collars. An occasional small tubular duct present on the venter of the head, thorax or anterior abdominal segments of some specimens (fig. 1, H). Trilocular pores scattered on the venter at about the same density as on the dorsum. Venter sparsely covered with scattered setae of two principal size groups; the longer about 27 to 48 μ long, and the shorter about 12 to 15 μ long (fig. 1, H). Longer setae of the venter of the head anterior to the rostrum about 54 to 64 μ long. Apical setae of anal lobes slightly longer than anal ring setae (anal lobe setae about 150 μ long, anal ring setae 125 to 130 μ long).

Circulus moderately large, distinct, about 110 μ long by about 125 μ wide. Rostrum two-segmented, about 180 μ long by about 120 μ wide at base. Antennae eight-segmented in all specimens at hand, about 435 μ long. Legs of moderate size, the femora stout (hind femora about 200 to 270 μ long by about 90 μ maximum width). Femora and tibiae of

FIG. 1. *Dysmicoccus neobrevipes* n. sp.: A, dorsal and ventral aspects of mature female (trilocular pores have been omitted); B, anal cerarius; C, ventral sclerotized area of anal lobe; D, penultimate cerarius; E, anterior thorasic cerarius; F, interantennal cerarius; G, portion of derm of eighth abdominal segment; H, portion of derm of venter of thorax; I, portion of derm at margin of venter of eighth abdominal segment; J, claw of hind tarsus; K, eye and associated marginal disc pores; L, detail of large multilocular pore of venter; M, detail of small ventral tubular duct; N, detail of larger ventral tubular duct; O, detail of small dorsal disc pore showing the apparently loculate structure; P, detail of small disc pore associated with eye; Q, detail of trilocular pores.

hind legs with numerous translucent dots on upper surfaces (fig. 2).

Body form broadly oval. The type specimen measures 1.68 mm. long by 1.13 mm. maximum width. The largest slide-mounted specimen studied measured 3.5 mm. long by 2.8 mm. wide.

Described from 27 specimens. Holotype and 5 paratypes on 2 slides, Honolulu, January, 1958, Walter Carter collector, on tuberose (*Polianthes tuberosa* L.); 11 paratypes on 5 slides, Honolulu, January, 1958, Walter Carter collector, on *Agave;* 1 paratype, Honolulu, January 10, 1958, Walter Carter collector, ex laboratory colony on pineapple leaf; 3 paratypes on one slide, Honolulu, May 22, 1958, Walter Carter, collector, ex laboratory colony on pineapple leaf; 6 paratypes on 2 slides, Aina Haina, Oahu, April, 1958, J. W. Beardsley collector, on *Agave sisalana* (Engelm.) Perrine.

Holotype and paratypes deposited in the U. S. National Coccid Collection, U. S. Department of Agriculture, Washington, D. C. Additional paratypes placed in the collections of the Bernice P. Bishop Museum; Experiment Station, HSPA; and the Pineapple Research Institute; all in Honolulu.

The following additional Hawaiian material, definitely assignable to this species, also has been studied: Honolulu, Oahu, April 27, 1904, D. L. Van Dine collector, on *Agave sisalana;* Kunia, Oahu, May 14, 1947, A. Suehiro collector, ex pineapple; Honolulu, July 17, 1945, E. C. Zimmer-

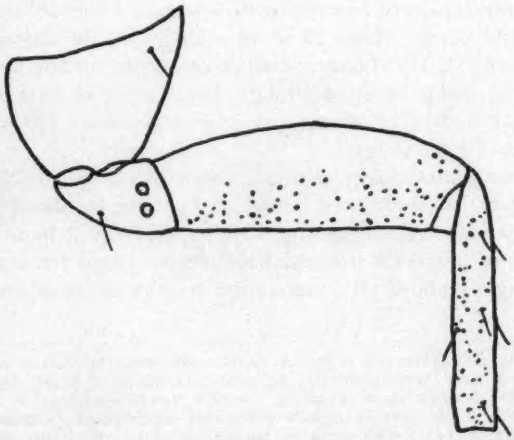


FIG. 2. Hind leg of *Dysmicoccus neobrevipes* (tarsus omitted) showing the distribution of the small translucent spots on the upper surface of the femur and tibia.

man collector, on *Pandanus* aerial roots; Manoa, Honolulu, August 11, 1947, E. C. Zimmerman collector, on sunflower; Hawaii (no exact locality), May 22, 1952, H. A. Woolford collector, on *Alpinia purpurata* (Vieill.) K. Schum. (red ginger); Kailua, Oahu, March, 1956, L. Chilson collector, on leaves of *Nothopanax* sp. (panax); Wailupe Valley, Oahu, August 6, 1955, J. W. Beardsley collector, under loose bark of *Acacia koa* Gray; Hanauma Bay, Oahu, June, 1956, J. W. Beardsley collector, on terminal leaves of *Thespesia populnea* (L.) Sol., and on flower and fruit clusters of *Messerschmidia argentea* (L. f.) Johnston; Wiliwilinui Ridge Road, Oahu, May, 1958, J. W. Beardsley collector, on pads of *Opuntia megacantha* Salm-Dyck; Mapulehu, Molokai, Jan. 24, 1957, J. W. Beardsley collector, on leaves and petioles of *Acacia farnesiana* (L.) Willd; Waimea, Kauai, Jan. 6, 1944, N. L. H. Krauss collector, on *Samanea saman* (Jacq.) Merr. (monkeypod).

The specimens of *D. neobrevipes* which have been studied show a considerable range of variation in some characters. The maximum size of mature females appears to be dependent somewhat upon the host on which the mealybugs develop. (e.g.: females which develop on *Agave* frequently are considerably larger than those which develop on pineapple). There is also some variation in the number of conical setae in the cerarii anterior to the anal pair, sometimes even in corresponding cerarii on opposite sides of the same specimen. In some examples there is little apparent differentiation of the tubular ducts of the lateral margins of the venter into two size groups, but in others such differentiation is quite marked (fig. 1; I, M, N). The numbers of both ventral tubular ducts and multilocular pores vary somewhat from specimen to specimen, as do the lengths of the appendages.

Dysmicoccus neobrevipes differs from *D. brevipes*, as that species has been defined by Balachowsky (1957), primarily in the form of the ventral sclerotization of the anal lobes and in the absence of long setae on the dorsum of the abdomen. In all specimens of *D. brevipes* which I have examined, the ventral sclerotized area of each anal lobe is roughly quadrate. In *D. neobrevipes* these sclerotized areas are conspicuously elongate, usually two or more times as long as wide. In *D. brevipes* there is a small but conspicuous group of several long setae on either side of the mid-dorsal axis of the ninth abdominal segment. These setae range from about 45 μ to about 80 μ in length. In *D. neobrevipes* the longest setae in this region measure about 15 μ, and are not conspicuously longer than other dorsal setae. In the specimens which I have studied there also appears to be slight differences in the relative lengths of the apical setae of the anal lobes and the anal ring setae in the two species. In *D. brevipes* the apical setae are about 1.4 times as long as the anal ring setae, whereas in *D. neobrevipes* the apical setae are about 1.2 times as long.

In several respects *D. neobrevipes* appears to be more closely related to *D. probrevipes* (Morrison) (1929) than to *D. brevipes*. I have not

seen specimens of the former species, but Dr. Harold Morrison has kindly compared type material of *D. probrevipes* with paratypes of *D. neobrevipes*. *D. probrevipes* possesses an elongate sclerotized area on the venter of each anal lobe and lacks the group of long preanal dorsal setae, both characters in common with *D. neobrevipes*. The small disc pores found in both *D. brevipes* and *D. neobrevipes* also occur in small numbers on the dorsum of *D. probrevipes*. *D. probrevipes* possesses six- or seven-segmented antennae, whereas all specimens of *D. neobrevipes* studied have eight-segmented antennae. Also, *D. probrevipes* has considerably fewer of the large perivulvar multilocular pores (Dr. Morrison found only about 15) than does *D. neobrevipes*. The appendages of *D. probrevipes* were found by Dr. Morrison to be somewhat shorter than those of D. *neobrevipes* (e.g.: the hind femora of *D. probrevipes* measured about 168 μ as compared to a range of about 200 to 270 μ in the type material of *D. neobrevipes*).

D. neobrevipes colonies differ, both in their biology and in general appearance, from all colonies of Hawaiian *D. brevipes* which I have studied. *D. neobrevipes* is apparently ovoviviparous. The normal mode of reproduction appears to be bisexual as winged males developed in all the colonies studied. Males were never found in colonies of Hawaiian *D. brevipes*. The fully mature female of *D. neobrevipes* is broadly oval in shape, and the dorsum is quite heavily coated with white mealy wax which is usually formed into tiny tufts. A series of short wax filaments extends from the margin of the body completely around the insect. The length of most of these filaments is equal to about one-third the maximum width of the dorsum. The caudal pair of filaments is longer, being equal to about one-third to one-half the length of the body. The general color of mature female specimens is grayish. When the wax is removed the body color is found to be a grayish-orange. A small amount of cottony wax extends from the vulvar region in reproducing females.

In the *D. brevipes* colonies which were examined the color of the individual mealybugs was definitely more of an orange or pinkish-orange than that of mature *D. neobrevipes* females. The apparent color difference in fully mature females of the two species seems largely due to the thicker covering of dorsal wax in *D. neobrevipes* which more effectively obscures the orange color of the body contents. Young last-instar individuals of *D. neobrevipes* which have not yet developed the heavy covering of dorsal wax are very similar in color to *D. brevipes* females.

Although both *D. brevipes* and *D. neobrevipes* are rather polyphagous, it appears that each normally inhabits a different portion of its host plant. *D. neobrevipes* has been found only on aerial parts of its hosts; on leaves, stems, aerial roots, and flower and fruit clusters. *D. brevipes* colonies are usually found near the base of their host plants. They oc-

cur normally on the butts of pineapple plants, on the lower stalks of sugar cane and on lower portions of stems or on the partially exposed roots of various grasses and herbaceous plants. Although *D. brevipes* is commonly found infesting graminaceous plants, *D. neobrevipes* has not yet been found on grasses.

Since specimens from pineapple from Oahu are definitely assignable to *D. neobrevipes,* it seems likely that one of the two "strains" of *D. brevipes* studied by Ito (1938) actually was this species. Ito states that the gray "strain" of *D. brevipes* normally reproduces bisexually, whereas the pink "strain" is strictly parthenogenetic, no males ever being produced. These findings, as well as the color differences, are in line with my observations of colonies of the two species here considered.

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New Species and New Records of Endemic Hawaiian Mealybugs (Homoptera: Pseudococcidae)

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The mealybug species considered in this paper are all apparently endemic to the Hawaiian Islands. Each has been found only on a single species or a few closely related species of native plants. Other undescribed species from the islands of Oahu and Hawaii are at hand, and additional specialized collecting for these unobtrusive insects may be expected to bring to light many more new forms. The native mealybug fauna of the island of Kauai, for example, is virtually unknown, the single endemic species so far described from that island having been removed from a museum herbarium specimen (Beardsley, 1957).

The proper generic assignment of many of our Hawaiian mealybugs presents a difficult problem. Since the Zimmerman-Ferris treatment of the Hawaiian species in 1948, the generic classification of North American mealybugs has been extensively revised (Ferris, 1950, 1953). If one accepts the Ferris definition of such genera as *Pseudococcus* and *Trionymus* it is obvious that several of our endemic species cannot remain in the genera to which they were originally assigned (e.g.: *Pseudococcus straussiae* Ehrhorn, *Trionymus refertus* Ferris). As a temporary expedient I have placed the new species described below within long established genera. When the mealybug faunas of Hawaii and other Pacific areas are adequately known, more clearly defined relationships than are now evident may become apparent.

Genera are here considered in the same order as they are treated in Volume 5 of INSECTS OF HAWAII (Zimmerman, 1948).

Field work on the island of Hawaii, the results of which are reported here in part, was made possible through a grant of funds from the McInerny Foundation of Honolulu. I wish to express my appreciation to the McInerny Foundation for its support of this work.

Holotypes of the new species described below are deposited in the Bernice P. Bishop Museum, Honolulu. Paratypes have been placed in the Bishop Museum; the collection of the Experiment Station, HSPA, Honolulu; and in the National Coccid Collection in the U. S. Department of Agriculture, Washington, D.C.

Pedronia acanthocauda Beardsley

Pedronia acanthocauda Beardsley, 1957, Proc. Haw. Ent. Soc. 16 (2): 230–231, fig. 5.

This mealybug was described from material removed from herbarium specimens of the host housed in the Bernice P. Bishop Museum, Honolulu. On January 1, 1959, I collected living material of the species from a clump of the type host, *Dicranopteris owhyhensis* Hooker, which was found along the Koolau Summit Trail, Oahu, about one-half mile southeast of its juncture with Poamoho Trail. The mealybugs were found within aborted, rolled-over pinnule tips of the host fronds, like those from which the type material was removed. A number of parasitized females were found and several adults of a black endemic species of *Anagyrus* were reared. Male cocoons were also present and a few winged adult males were secured.

Pedronia cibotii Beardsley

Pedronia cibotii Beardsley, 1957, Proc. Haw. Ent. Soc. 16 (2):222–224, fig. 2.

Previously known only from Mt. Tantalus, Oahu, this species recently has been collected at an additional locality on Oahu (near the summit of the Poamoho Trail), and in the Kilauea Volcano area on the island of Hawaii. Both collections were from the type host, *Cibotium chamissoi* Kaulfuss. Specimens of both these lots show variations in the development of the cerarii not found in the type series. Instead of possessing four conical setae of nearly equal size on each abdominal cerarius anterior to the anal pair, as in the type, many of these specimens have two of the conical setae much reduced in size, and in some cases one or two of the spines are entirely absent from some cerarii. These differences are considered too slight to warrant the erection of a new name, however.

Pedronia hawaiiensis Ferris

Pedronia hawaiiensis Ferris, 1948, Ins. Hawaii 5:168, fig. 97

A specimen of this species was removed from a herbarium specimen of *Dicranopteris owhyhensis* Hooker in the Bishop Museum which was collected on Mt. Konahuanui, Oahu, July 3, 1872, by Hillebrand and Lydgate. In addition, I have recently collected specimens on *D. emarginata* (Brack.) W. Robins found growing along the Kipapa and Poamoho Trails in the Koolau Mountains of Oahu. These are new host records for the species which previously has been collected only on *D. linearis* (Burmeister) Underwood. On *D. emarginata* the mealybugs were found associated with the same sort of rosette deformation of the host pinnules which is characteristic of infestations on *D. linearis* (see Beardsley, 1957).

Clavicoccus tribulus Ferris

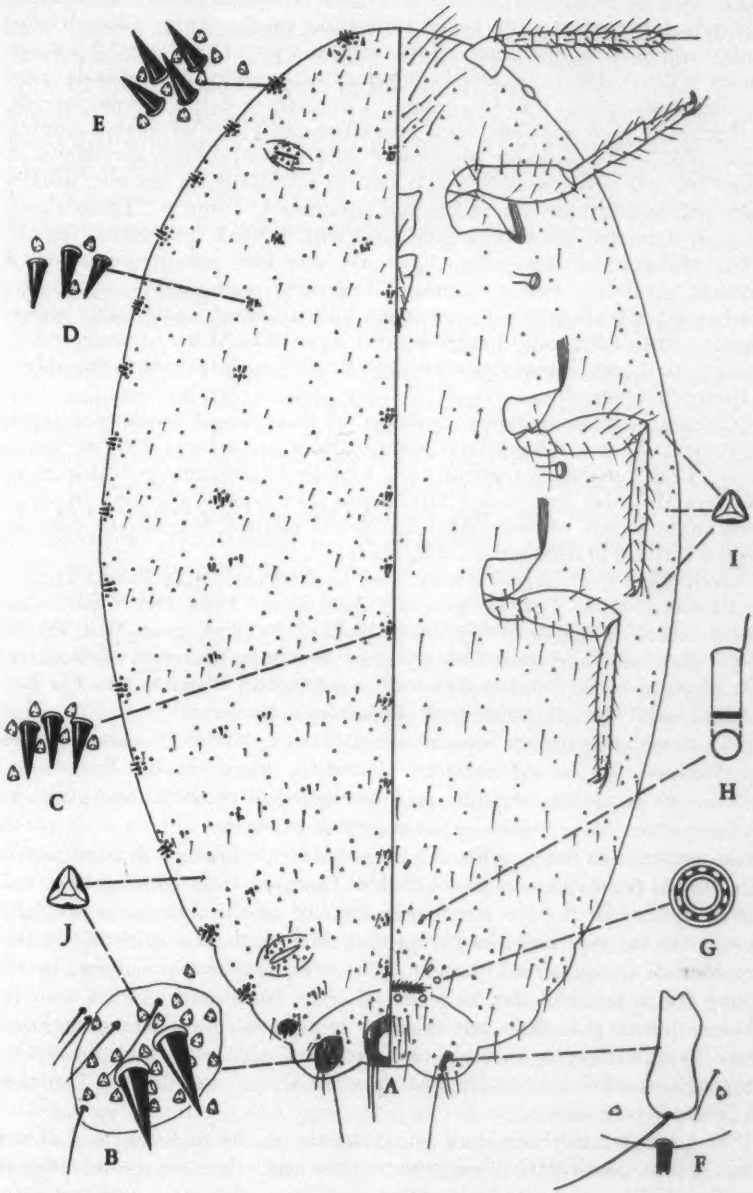
Clavicoccus tribulus Ferris, 1948, INS. HAWAII 5:174, fig. 99.

This unusual mealybug, previously known only from the type material, has been collected several times during the past two years from the lower surfaces of leaves of *Hibiscus arnottianus* Gray along the Manoa Cliff Trail, Mt. Tantalus, Oahu. The host is common along that trail, and, although the leaves of many of these plants were searched, I found the mealybug present only in one small area. It seems worthy of note that the undersurfaces of the leaves of those plants which harbored mealybugs were slightly tomentose, whereas on all other plants examined the undersides of the leaves were quite glabrous.

Pseudococcus dorsispinosus, new species (fig. 1.)

Female. With 17 pairs of marginal cerarii, the anal pair each with 2 conical setae about 22 μ long plus 3 or 4 slender accessory setae 24 to 45 μ long, surrounded by a concentration of about 18 to 24 trilocular pores, and borne on an area of weak to moderate sclerotization (fig. 1, B). Penultimate cerarii each with 2 conical setae about 16 μ long, 1 or 2 slender accessory setae about 24 to 32 μ long, and a small concentration of about 8 to 12 trilocular pores borne on a small area of weak sclerotization (fig. 1, C). Anterior marginal cerarii unsclerotized except for a narrow area around the bases of the conical setae in some; most with 2 conical setae about 12 μ long, some of those on head and thorax and occasionally the anterior abdominal segments with 3 or 4 such conical setae; slender accessory setae frequently lacking, a single seta occasionally present; each with a few trilocular pores (4 to 9 in type) around the bases of the conical setae (fig. 1, E). A medio-dorsal cerarius present on each discernible abdominal segment anterior to the ninth, 2 or 3 such cerarii on the thorax, and one on the head between the anterior dorsal ostioles, there being 10 or 11 such cerarii in the series. Each medio-dorsal cerarius (fig. 1, C) consisting of from 2 to 4 conical setae about 12 μ long and a small concentration of about 3 to 6 trilocular pores; without slender accessory setae. A less complete series of cerarii present sublaterally on each side of the dorsum, one cerarius of the series on each of most of the segments between the anterior and posterior pairs of dorsal ostioles. These cerarii consisting of from 1 to 4 conical setae about 12 μ long plus a few trilocular pores (fig. 1, D). A few scattered small or slender conical setae present between the medio-dorsal and sublateral series, particularly on the posterior portion of the dorsum

FIG. 1. *Pseudococcus dorsispinosus*, n. sp. A, dorsal and ventral aspects of mature female; B, anal cerarius; C, medio-dorsal cerarius, D, sublateral cerarius; E, anterior marginal cerarius; F, ventral sclerotized area of anal lobe; G, multilocular disc pore; H, ventral tubular duct; I, ventral trilocular pore; J, dorsal trilocular pore.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and near the interantennal cerarii. Dorsal trilocular pores evenly, fairly sparsely scattered; a trifle larger than those of the venter (dorsal triloculars about 4.5 μ maximum width, ventral triloculars about 3.5 μ maximum width) (fig. 1, J). Dorsal tubular ducts absent. Dorsal body setae sparse, short (about 9 to 18 μ long). Two pairs of dorsal ostioles present.

Venter of each anal lobe with a small elongate area of weak sclerotization (fig. 1, F); probably discernible only in well-stained specimens. A very few (usually about 6) small ventral tubular ducts present, usually one pair submedially on abdominal segments 6, 7 and 8. These about 3 μ in diameter, about 6 μ long, and with a weak oral collar (fig. 1, H). Multilocular disc pores (fig. 1, G) very few, usually about 6 or 8 located about the vulvar opening. Trilocular pores (fig. 1, I) evenly, rather sparsely distributed over venter. Ventral body setae fairly sparse, mostly 30 to 80 μ long; longer ventral setae of head up to about 120 μ long. Anal lobe setae about 110 to 130 μ long; anal ring setae about 110 to 140 μ long.

Circulus absent. Antennae 7-segmented in type and several paratypes, 8-segmented or 7-8-segmented combinations in others; 290 to 360 μ long. Beak 2-segmented, about 130 μ long by 75 μ maximum width. Legs moderately short and stout; hind femora of type 175 μ long by 63 μ maximum width. A few very tiny, poorly defined, translucent dots on upper surfaces of hind femora and tibiae.

Body form oval; type 1.8 mm. long by 0.93 mm. maximum width.

Described from 17 slide-mounted specimens. Type and 2 paratypes on 3 slides: ex leaves of *Pipturus*, Waikane Trail, Koolau Mts., Oahu, July 22, 1956, J. W. Beardsley collector. Fourteen paratypes on 9 slides: on *Pipturus* leaves, valley below Puu Kanehoa, Waianae Mts., Oahu, Sept. 14 and Oct. 27, 1958, J. W. Beardsley collector.

This mealybug may be separated easily from all other Hawaiian species of *Pseudococcus* by the presence of distinct dorsal cerarii. Eventually, a new genus almost certainly must be erected to received this species as it cannot remain in *Pseudococcus* as defined by Ferris.

In addition to the type material, a series of specimens is at hand which I collected from *Pipturus* leaves on Mt. Tantalus, Oahu, during 1957 and 1958, and which I have tentatively assigned to this species. These are similar to the type material except that there is marked reduction in the number of dorsal cerarii present. The sublateral series is absent in all these specimens, and the medio-dorsal series is reduced to form 4 to 10 discernible cerarii. It is felt that the number of dorsal cerarii present may be a somewhat variable character, and that with additional collecting specimens intermediate between the typical and the Mt. Tantalus forms may be found.

The living mealybugs were found mostly on the undersurfaces of the host leaves, particularly along the midribs and other large veins. When collected they were very pale yellow to almost white in color, and each

possessed a complete set of 17 pairs of short peripheral wax filaments. Each filament of the caudal pair was equal in length to about one-third the maximum width of the dorsum, while the anterior filaments were equal to only about one-eighth of the width of the dorsum. Very short humps of wax were present on the dorsum at the sites of the medio-dorsal and sublateral cerarii. Male cocoons were common in the Mt. Tantalus material, and a number of small winged males were reared. A few parasitized individuals were found and a small black species of *Anagyrus*, presumably endemic, emerged from one of these.

Pseudococcus floriger Ferris

Pseudococcus floriger Ferris, 1948, Ins. Hawaii 5:212–213, fig. 120.

Specimens of this species are at hand from the following localities: above Kawela, Molokai, 1,500 ft., Dec. 13, 1956, J. W. Beardsley collector; Wailupe Valley, Oahu, 1,000 ft., Dec. 26, 1956, J. W. Beardsley collector; hills behind Wahiawa, Oahu, July 11, 1957, E. J. Ford collector. These collections were all from the type host, *Dracaena aurea* H. Mann. The species previously has been known only from the type locality; Kanaio, Maui. The Molokai and Wailupe Valley, Oahu specimens agree quite closely with the type material. The number of cerarii present in specimens of these lots varies mostly between 5 and 8 pairs, although a few specimens have as many as 10 discernible pairs. Some specimens have the multilocular disc pores restricted to the venter of abdominal segments 8 and 9, as in Ferris' figure, but others have 2 to 4 additional pores along the posterior margin of abdominal segment 7. Most specimens possess a few oral rim tubular ducts in the medio–dorsal areas of the thorax and abdomen. Although tubular ducts in these areas are not indicated in Ferris' figure of the type, examination of the type slide in the Bishop Museum revealed the presence of a few such ducts.

Specimens from behind Wahiawa, Oahu, differ more noticeably from the type material than do those from the two lots previously discussed. Wahiawa specimens possess from 10 to as many as 15 discernible pairs of cerarii. Multilocular disc pores also are slightly more numerous, there being 4 to 6 or so along the posterior margin of the venter of abdominal segment 7. As in the other two lots, most of these specimens possess a few medio-dorsal oral rim tubular ducts on both abdomen and thorax.

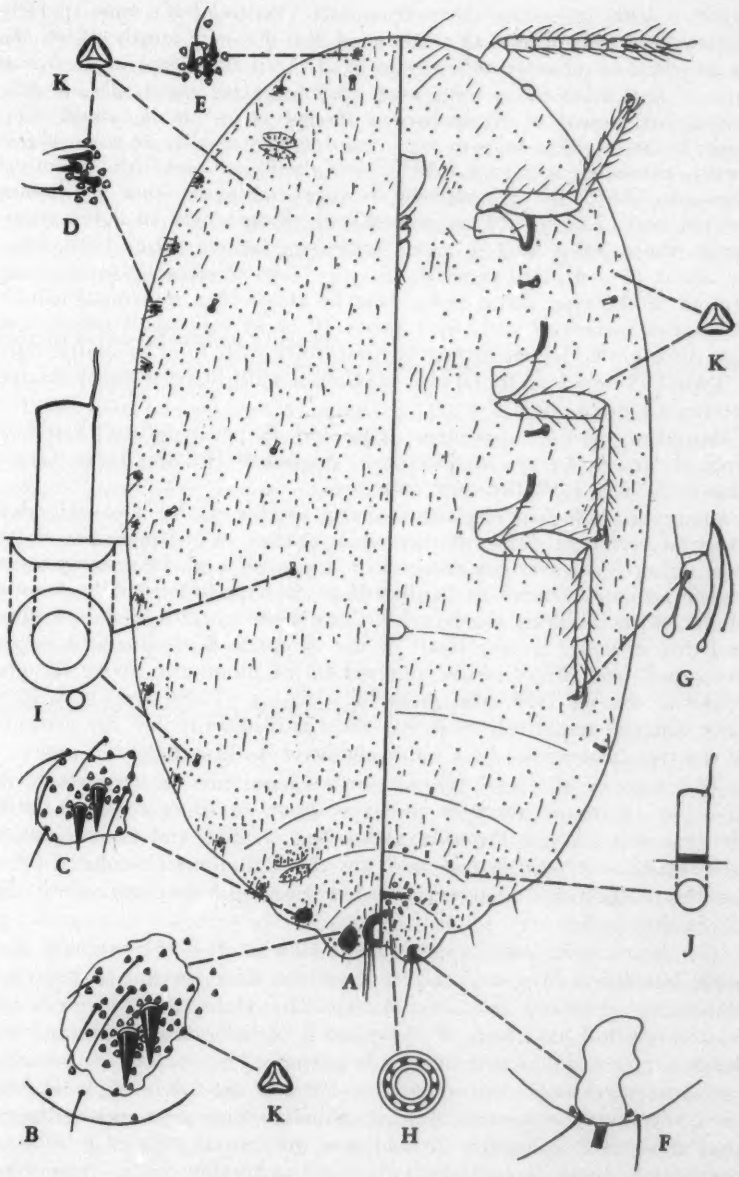
This appears to be a somewhat variable species, particularly with respect to such characters as the number of pairs of cerarii developed and the number of multilocular pores present. However, the absence of the circulus plus the presence of numerous marginal tubular ducts will serve to distinguish it from any other described Hawaiian species of *Pseudococcus*.

Pseudococcus lycopodii, new species (fig. 2)

Female. With 14 to 16 pairs of lateral cerarii; all 8 abdominal pairs present, but 1 to 3 of the thorasic and cephalic pairs absent. Anal cerarii each with 2 conical setae about 20 to 24 μ long, 4 or 5 slender accessory setae 18 to 36 μ long, surrounded by a concentration of about 40 to 50 trilocular pores, and borne on a well-defined sclerotized area (fig. 2, B). Penultimate cerarii each with 2 conical setae about 14 to 16 μ long, plus 4 or 5 slender accessory setae about 18 to 27 μ long, surrounded by a concentration of about 25 to 30 trilocular pores, and borne on a well-defined sclerotized area (fig. 2, C). Anterior abdominal cerarii each with 2 conical setae 10 to 14 μ long, plus 1 to 3 slender accessory setae 12 to 18 μ long, surrounded by a concentration of about 10 to 15 trilocular pores; surrounding derm unsclerotized. Existing thorasic and cephalic cerarii with 2 or 3 conical setae 10 to 14 μ long, plus 1 to 3 slender accessory setae about 12 to 18 μ long, and a concentration of a few (usually 4 to 12) trilocular pores (fig. 2, D, E). Dorsum always with a few prominent oral rim tubular ducts, the exact number variable (4 to 12 in specimens of the type series). These mostly along the lateral margins near the cerarii, but many specimens with at least 1 or 2 such ducts situated submedially on 1 or more segments of thorax and/or abdomen. Individual ducts (fig. 2, I) with outside diameter of rim about 9 μ, diameter of orifice about 5 μ, length about 12 μ. One or more very small circular pores, about 1.5 μ in diameter, frequently located near margins of tubular ducts; such pores also sometimes found on the dorsum well away from tubular ducts, particularly along the lateral margins near the cerarii. Trilocular pores moderately densely scattered over dorsum, slightly more concentrated on lips of dorsal ostioles. Dorsum sparsely clothed with fine setae ranging from about 9 μ to about 27 μ in length. Two pairs of dorsal ostioles present.

Venter of anal lobes with a small irregularly elongate area of weak sclerotization (fig. 2, F). Most specimens with a few oral rim tubular ducts (from 1 to 6 in type series) like those of the dorsum located along the lateral margins of the venter of the thorax and abdomen; these absent in a few specimens. A few small tubular ducts (10 to 20 or so in type series) present on venter of posterior abdominal segments, mostly around the vulvar opening, a few along the posterior margin of abdominal segment 7, and 1 or 2 on the posterior margin of segment 6 in some specimens. These ducts about 3 μ in diameter, about 6 μ long, and with a weak oral collar (fig. 2, J). About 8 to 14 multilocular disc pores (fig. 2, H) around the vulvar opening, plus 1 or 2 along the posterior margin of

FIG. 2. *Pseudococcus lycopodii,* n. sp. A, dorsal and ventral aspects of mature female; B, anal cerarius; C, penultimate cerarius; D, thorasic cerarius; E, cephalic cerarius; F, ventral sclerotized area of anal lobe; G, claw of hind tarsus; H, multilocular disc pore; I, dorsal oral rim tubular duct; J, ventral tubular duct; K, trilocular pores.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abdominal segment 7 in some specimens. Scattered trilocular pores of venter a trifle less dense than on dorsum. Ventral body setae sparsely scattered, a trifle longer than those of the dorsum; mostly 10 to 38μ in length. Longer setae of venter of head about 80 to 90 μ long. Apical setae of anal lobes about 110 μ long; anal ring setae about 125 μ long.

Circulus present in all specimens of type series, small (about 80 μ wide by about 35 μ long in type, considerably smaller in some specimens), extending across the fold between the fourth and fifth abdominal segments. Antennae 8-segmented in type and most other specimens; one or both 7-segmented or incompletely 8-segmented in a few specimens; about 360 μ long in type. Beak 2-segmented, about 120 μ long by about 75 μ maximum width in type. Legs moderately small; hind femora of the type about 180 μ long by about 60 μ maximum width; the upper surface of each with about 10 or so very small translucent dots discernible. Upper surface of hind tibiae with 15 or so similar dots.

Type 1.75 mm. long by 1.0 mm. maximum width; largest slide-mounted specimen 1.9 mm. long.

Described from 20 specimens (type and 19 paratypes on 13 slides) from club-moss, *Lycopodium cernuum* L., North Halawa Ridge, Oahu, March 15, 1958, J. W. Beardsley collector.

Some morphological characters of this species exhibit a considerable range of variation. The circulus, while present in all specimens of the type series, is considerably reduced in size in some of the paratypes. In a series of specimens which I collected on the type host near the summit of the Poamoho Trail, Oahu, all but one show no trace of the circulus; and this structure is very small in the exceptional specimen. A single individual from *Lycopodium* collected in the mountains above Kawela, Molokai, during 1958, also lacks the circulus. These specimens have been assigned tentatively to *P. lycopodii* as it appears that the presence of the circulus may not be a stable character in this species.

The number of dorsal tubular ducts varies from as few as 4 to as many as 12 in specimens of the type series. A single specimen from the type host taken at Pupukea, Oahu, Nov. 2, 1958, and which is otherwise similar to typical *P. lycopodii,* has about 20 discernible dorsal tubular ducts. Additional material is needed to establish the limits of variability in this species.

Pseudococcus lycopodii appears to be closely allied to *P. swezeyi* Ehrhorn, but differs in several respects from the three specimens of the latter species (ex *Acacia koa* Gray, Mt. Tantalus, Oahu, E. M. Ehrhorn collector) which I have seen. *P. lycopodii* is considerably smaller and has fewer rim tubular ducts than does *P. swezeyi.* The circulus of the latter species is quite large (about 120 μ by 120 μ in the specimens seen) and the conical setae of the anal and penultimate cerarii are somewhat larger than those of *P. lycopodii.* In addition, the ventral setae of *P. swezeyi,* particularly those around the vulva, are noticeably longer than those

of *P. lycopodii*.

The living specimens of *P. lycopodii* were found at the bases of the awl-shaped "leaves" of the club-moss host. The mealybugs were grayish in color and their dorsal surfaces lightly covered with powdery wax. Short wax filaments extended from the cerarii of undisturbed specimens. The length of each of the caudal pair of filaments was equal to about four-fifths the maximum width of the dorsum, and each of the penultimate pair was about one-half as long. The anterior filaments were even shorter. Male cocoons were present on the host and winged males emerged from several of these. A single mumified individual found on *Lycopodium* at Pupukea, Oahu, yielded an adult of a small, black, apparently endemic species of *Anagyrus*.

Pseudococcus montanus Ehrhorn

Pseudococcus montanus Ehrhorn, 1916, Proc. Haw. Ent. Soc. 3 (3) :242

This species was reported from the island of Hawaii by Ehrhorn (1922), but Zimmerman (1948) listed the record as questionable as apparently no Hawaii specimens were available to him for study. Specimens which I collected from *Freycinetia arborea* Gaudichaud along the Kalapana Road, Hawaii, at the margin of the 1955 lava flow, August 16, 1958, agree well with Ferris' (1948) figure (Ins. Hawaii 5, fig. 126) and with Oahu specimens in my collection. The species was also listed by Ehrhorn from *Astelia veratroides* Gaudichaud from Oahu, but I have been unable to find it on that host. On Hawaii, I found a similar but distinct new species infesting *Astelia*.

Pseudococcus peleae, new species (fig. 3)

Female. With but 2 or 3 definite pairs of cerarii; an anal pair, a metathorasic pair, and sometimes an interantennal pair. Anal cerarii each with 2 conical setae 21 to 24 μ long, plus 5 to 7 slender accessory setae about 27 to 45 μ long, surrounded by a concentration of from 25 to 30 trilocular pores, and borne on a moderately well sclerotized area (fig. 3, B). Metathorasic cerarii each bearing 2 small conical setae about 10 μ long, plus 5 to 7 slender accessory setae 18 to 30 μ long, surrounded by a group of 10 to 15 trilocular pores only slightly more concentrated than on the dorsum; surrounding derm without evident sclerotization (fig. 3, C). Interantennal cerarii sometimes absent on one or both sides; when present, represented by 2 conical setae about 12 μ long plus 2 or 3 slender accessory setae about 30 μ maximum length (fig. 3, D). Lateral margins of dorsum with conspicuous tubular ducts in segmentally arranged groups of from 2 to 4 (fig. 3, D, E); these ducts about 6 μ in diameter at mouth, about 12 μ long, usually with a faint oral collar, occasionally with a poorly-defined oral rim (fig. 3, I). Trilocular pores (fig.

3, K) moderately densely, evenly, scattered over dorsum; slightly more concentrated on lips of dorsal ostioles. Two pairs of dorsal ostioles present.

Venter of anal lobes with an elongate moderately well sclerotized area (fig. 3, F). Ventral tubular ducts absent. Multilocular disc pores (fig. 3, J) very few, 2 to 4 discernible just behind the vulvar opening in the specimens available. Venter with scattered trilocular pores; these a bit more numerous in the lateral areas. Ventral body setae sparsely scattered, slightly longer than those of the dorsum, 25 to 40 μ long (fig. 3, G); longer setae of venter of head about 120 μ maximum length. Apical setae of anal lobes about 120 μ long; anal ring setae about 130 μ long.

Circulus present, small, about 60 μ wide by about 25 μ long; lying across the fold between the fourth and fifth abdominal segments. Antennae 8-segmented in all specimens, 480 μ long in type. Beak 2-segmented, about 100 μ long, 84 μ maximum width. Legs well developed, rather slender; hind femora of type 254 μ long, 51 μ maximum width. About 20 translucent dots discernible on upper surface of each hind femur.

Type 1.7 mm. long by 0.86 mm. maximum width; largest slide-mounted specimen 2.2 mm. long.

Described from 10 specimens. Type and 9 paratypes on 9 slides: on *Pelea* sp., North Halawa Ridge, Koolau Mts., Oahu, 2,000 ft., March 15, 1958, J. W. Beardsley collector.

The living mealybugs were found exposed on the under surfaces of the host leaves around the openings of old psyllid galls. The insects were pale greenish in color and their dorsa were lightly dusted with powdery wax. Each specimen possessed two conspicuous pairs of peripheral wax filaments; a caudal pair one-half to nearly as long as the body, plus a shorter pair, each equal in length to about one-half to two-thirds the maximum width of the body, which extended laterally from metathorasic cerarii. In addition to the cerarial wax filaments, each specimen bore numerous, fine, hair-like wax strands which extended from the lateral margins of the body. The longest of these was equal to about one-half the length of the body. These strands appeared to arise from the large tubular ducts along the lateral margins of the dorsum.

Pseudococcus syzygii, new species (fig. 4).

Female: With from 3 to 6 discernible pairs of cerarii. Anal cerarii each with 2 conical setae about 23 to 27 μ long, plus 5 to 7 slender ac-

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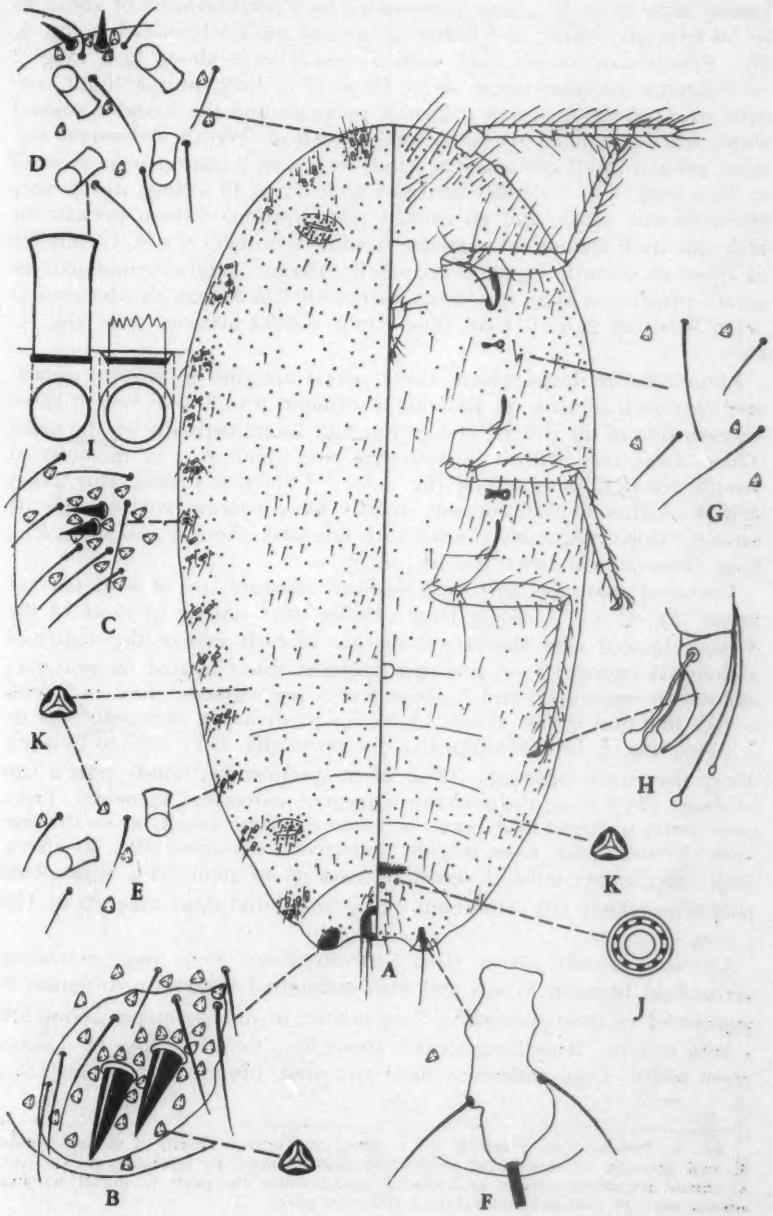
FIG. 3. *Pseudococcus peleae*, n. sp. A, dorsal and ventral aspects of mature female; B, anal cerarius; C, metathorasic cerarius; D, interantennal cerarius and associated tubular ducts; E, marginal abdominal tubular ducts; F, ventral sclerotized area of anal lobe; G, detail of ventral derm; H, claw of hind tarsus; I, details of dorsal tubular ducts; J, multilocular disc pore; K, trilocular pores.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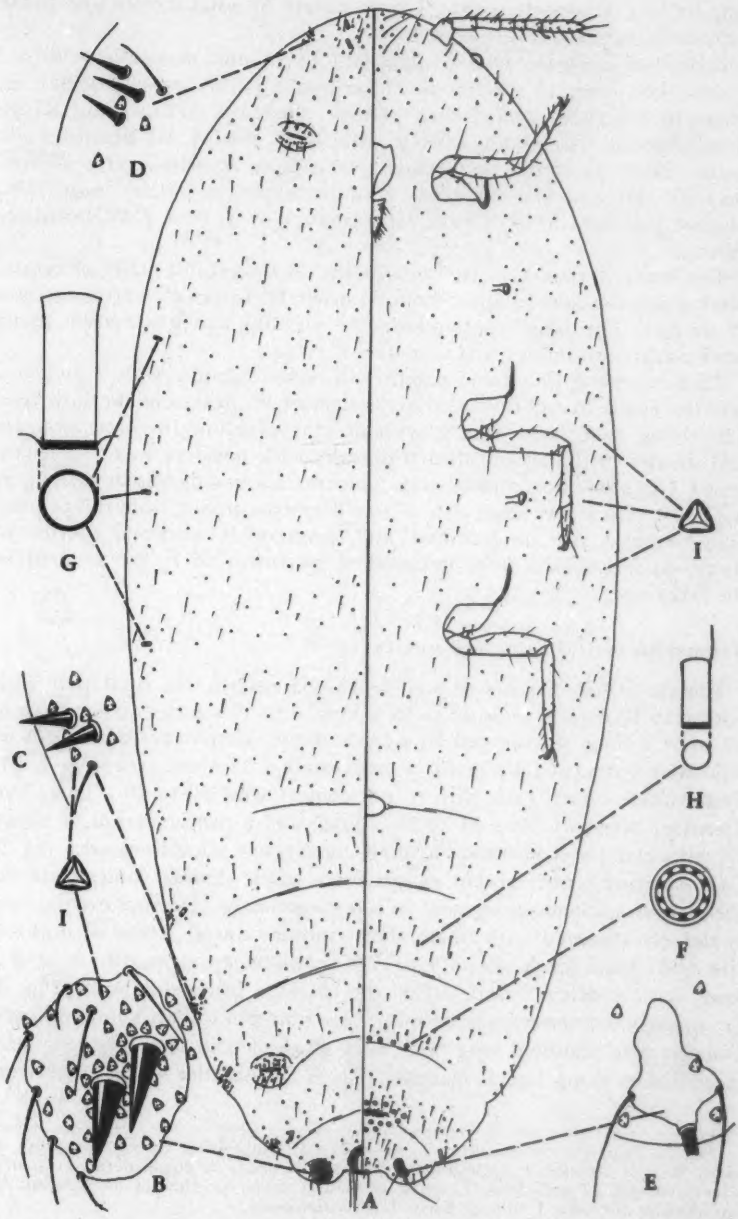
cessory setae 21 to 42 μ long, surrounded by a concentration of about 40 to 50 trilocular pores, and borne an area of weak sclerotization (fig. 4, B). Penultimate cerarii each with 2 conical setae about 15 μ long, 2 to 4 slender accessory setae about 18 to 25 μ long, plus a slight concentration of about 6 or 8 trilocular pores around the bases of conical setae; without evident sclerotization. Cerarii of seventh abdominal segment present in all specimens at hand; each with 2 conical setae about 9 to 12 μ long, 1 or 2 slender accessory setae 12 to 15 μ long, plus a very few trilocular pores, and no evident sclerotization. Cerarii present on fifth and sixth abdominal segments in some specimens (fig. 4, C), similar to those of seventh segment, frequently absent. Interantennal pair of cerarii present on some specimens, each with 1 to 3 small slender conical setae about 10 to 12 μ long, plus 1 to 3 slender accesory setae (fig. 4, D).

Large tubular ducts present along lateral margins of dorsum; usually one near each cerarius on abdominal segments 5 to 8, plus two or three on each side of the thorax, and two to four interantennally on the head. These ducts each with a narrow oral rim, about 6 μ in diameter at mouth, about 12 to 14 μ long (fig. 4, G). Trilocular pores evenly, fairly densely, scattered over dorsum; slightly more concentrated on lips of ostioles. Dorsum sparsely clothed with fine setae about 8 μ to about 27 μ long. Two pairs of dorsal ostioles present.

Venter of anal lobes with an irregularly elongate area of weak sclerotization (fig. 4, E). A single large tubular duct similar to those of the dorsum located near the lateral margin of each side of the venter of abdominal segment 8. A few small tubular ducts located on venter of abdominal segments 6 and 7, about 6 or 7 per segment; these each with a very fine oral collar, about 2.5 to 3 μ in diameter at mouth, 6 μ or 7 μ long (fig. 4, H). Multilocular disc pores (fig. 4, F) limited to a few about the vulvar opening, (18 to 28 in specimens at hand) plus a row of about 4 to 8 along the posterior margin of abdominal segment 7. Trilocular pores scattered over venter at about the same density as on the dorsum. Ventral body setae sparsely scattered, from about 10 μ to about 36 μ long; longer setae of venter of head up to about 64 μ long. Anal ring setae about 110 μ to about 120 μ long; anal lobe setae about 110 μ long.

Circulus present, about 60 μ wide by about 40 μ long, extending across fold between fourth and fifth abdominal segments. Antennae 8-segmented in most specimens; 7-segmented in one paratype; about 330 μ long in type. Beak 2-segmented, about 90 μ long by about 56 μ maximum width. Legs moderately short and stout; hind femora of type 156 μ

FIG. 4. *Pseudococcus syzygii*, n. sp. A, dorsal and ventral aspects of mature female; B, anal cerarius; C, cerarius of sixth abdominal segment; D, interantennal cerarius; E, ventral sclerotized area of anal lobe; F, multilocular disc pore; G, dorsal marginal tubular duct; H, ventral tubular duct; I, trilocular pores.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long by 54 μ maximum width. Upper surface on hind femora and tibiae with scattered small translucent dots.

Body from elongate; type 2.4 mm. long by 1.0 mm. maximum width.

Described from 16 specimens. Type and 2 paratypes on 3 slides: ex leaves of *Syzygium sandwicensis* (Gray) Niedenzu, Williwilinui Ridge Road, Koolau Mts., Oahu, 2,000 ft., March 25, 1956, J. W. Beardsley collector. Nine paratypes on 6 slides: same host, locality, and collector, Dec. 26, 1956 and May 30, 1958. Four paratypes on 4 slides: same host, summit, Pupukea Trail, Koolau Mts., Oahu, Nov. 2, 1958, J. W. Beardsley collector.

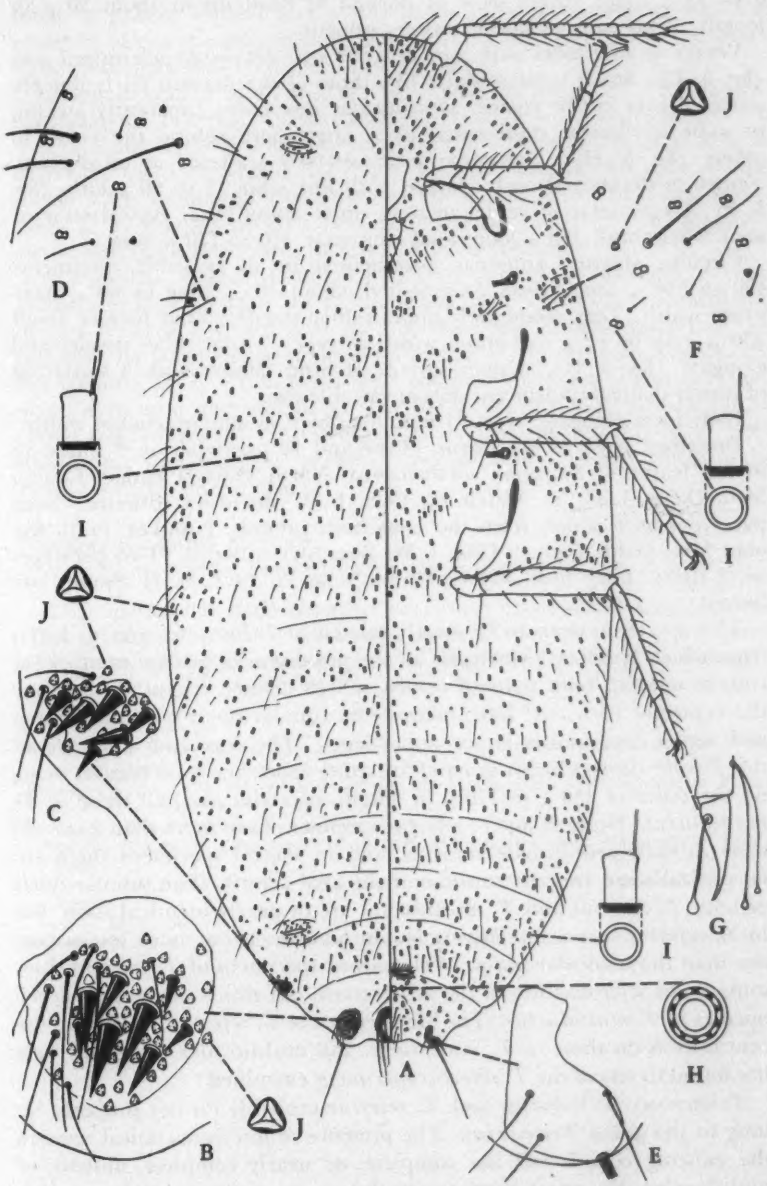
The marked reduction in the number of discernible pairs of cerarii present sets this species apart from all other Hawaiian *Pseudococcus* save *P. floriger*. The latter species lacks the circulus and has a great many more marginal tubular ducts than does *P. syzygii*.

This mealybug was found together in mixed colonies with *Trionymus refertus* Ferris in tightly rolled-over edges of the leaves of the host tree. The living mealybugs were grayish or grayish-yellow in color, elongate and slender in shape, and dusted dorsally with powdery wax. Each possessed a pair of short caudal wax filaments about one-fourth as long as the body, plus a very short pair of wax filaments arising from the penultimate cerarii. An unidentified and presumably endemic species of *Anagyrus* was reared from mummified specimens of *P. syzygii* held in the laboratory.

Trionymus multiductus, new species (fig. 5)

Female. With 2 pairs of well-developed cerarii; the anal pair each with 6 to 10 conical setae 13 to 25 μ long, 8 to 10 slender accessory setae 27 to 54 μ long, surrounded by a fairly dense concentration of about 60 trilocular pores, and borne on a moderately sclerotized area (fig. 5, B). Penultimate cerarii each with 6 to 8 conical setae 10 to 18 μ long, 3 or 4 slender accessory setae 27 to 35 μ long, and a concentration of about 20 trilocular pores borne on a small, moderately sclerotized area (fig. 5, C). Anterior cerarii absent except for a single slender conical seta on the seventh abdominal segment in a few specimens. Dorsum evenly, fairly densely scattered with small, short, tubular ducts. These of uniform size and shape, each about 4 to 5 μ in diameter at mouth, 5 or 6 μ long, with a distinct oral collar (fig. 5, I). Trilocular pores (fig. 5, J) sparsely scattered over dorsum, less numerous than tubular ducts. Dorsum with scattered long body setae 40 to 65 μ in length, particularly conspicuous along lateral margins (fig. 5, D); smaller dorsal body setae

FIG. 5. *Trionymus multiductus*, n. sp. A, dorsal and ventral aspects of mature female; B, anal cerarius; C, penultimate cerarius; D, detail of dorsal derm; E, ventral sclerotized area of anal lobe; F, detail of ventral derm; G, claw of hind tarsus; H, multilocular disc pore; I, tubular ducts; J, trilocular pores.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6 to 18 μ long; longer setae of dorsum of head up to about 90 μ in length. Two pairs of dorsal ostioles present.

Venter of anal lobes with a moderately well developed sclerotized area (fig. 5, E). Small tubular ducts like those of the dorsum fairly densely scattered over entire venter. Multilocular disc pores apparently lacking in some specimens; represented by a single pore behind the vulva in others (fig. 5, H). Trilocular pores sparsely scattered as on dorsum. Venter moderately densely clothed with fine setae 15 to 60 μ long (fig. 5, F); longer setae of venter of head up to about 90 μ. Apical setae of anal lobes about 160 μ long; anal ring setae 110 to 120 μ long.

Circulus absent. Antennae 8-segmented in all available specimens; 490 to 540 μ long. Beak 2-segmented, about 105 μ long by 80 μ maximum width. Legs moderately large, rather slender; hind femora about 330 μ long by 62 μ maximum width in type. Tarsal claws slender and elongate (fig. 5, G). Upper surface of hind femora with a scattering of poorly defined translucent dots of variable size.

Body form elongate; type 2.1 mm. long by 0.96 mm. maximum width.

Described from 30 specimens. Type and 18 paratypes on 8 slides: in folded leaves of *Syzygium sandwicensis*, North Halawa Ridge, Koolau Mts., Oahu, 1,500 ft., March 15, 1958, J. W. Beardsley collector. Nine paratypes on 5 slides: from the same host, summit, Pupukea Trail, Koolau Mts., Oahu, Nov. 2, 1958, J. W. Beardsley collector. Two paratypes on 2 slides: same host, Palolo, Oahu, June 12, 1918, O. H. Swezey collector.

This species appears to be closely related to *Trionymus refertus* Ferris from which it differs principally in the possession of greater numbers of conical setae in both pairs of cerarii, a well defined sclerotized area on the venter of each anal lobe, many more tubular ducts on both dorsum and venter, and much larger appendages. The legs and antennae of the *T. refertus* specimens at hand are quite short; the hind femora being on the order of 150 μ to 170 μ in length, or about one-half those of *T. multiductus*. None of my *T. refertus* specimens have more than 2 conical setae in each penultimate cerarius, and in several specimens there are no conical setae anterior to those of the anal cerarii. The tubular ducts of both *T. refertus* and *T. multiductus* are of nearly identical form, but in *T. refertus* they are relatively few in number, being much less numerous than the trilocular pores. Well stained specimens of *T. refertus* show some slight sclerotization of the anal cerarii, but this is not so well developed as in *T. multiductus*. The hind femora of *T. refertus* possess translucent dots as do those of *T. multiducus*, but multilocular disc pores were not found in any of the *T. refertus* specimens examined.

Trionymus multiductus and *T. refertus* probably do not properly belong in the genus *Trionymus*. The presence of multiple conical setae in the existing cerarii and the complete, or nearly complete, absence of multilocular disc pores seem to set these two species apart from other

forms assigned to *Trionymus*. Typical *Trionymus* apparently are confined to grasses, sedges, and a few other monocotyledons so that the presence of two species definitely attached to a dicotyledonous tree seems to be anomolous host relationship for the genus.

Living specimens of *T. multiductus* resembled those of *T. refertus* except that the two pairs of wax filaments present were much longer. In *T. multiductus* the caudal pair of filaments were from about as long as to nearly twice as long as the body, and the penultimate pair of filaments were about half the length of the caudal pair. In living specimens of *T. refertus* which I have collected the caudal pair of filaments were each about one-fourth or less as long as the body.

At Pupukea, Oahu, I found both *T. refertus* and *T. multiductus* present on a group of *Syzygium* trees along the trail. Laboratory examination of this material revealed that each of these species was apparently responsible for a particular type deformation of the infested host leaves. All colonies of *T. multiductus* were confined to leaves folded over longitudinally near the midrib so that the entire leaf was formed into a rather spacious pocket. Specimens of *T. refertus*, on the other hand, were found only within narrow pockets along the leaf margins formed by the tightly rolled-over leaf edges.

Nesococcus pipturi Ehrhorn

Nesococcus pipturi Ehrhorn, 1916, Proc. Haw. Ent. Soc. 3 (3) :246.

This species has been recorded previously from Oahu and Molokai. During August of 1958 I collected a series of specimens from the leaves of *Pipturus* growing within Kilauea-Iki Crater on the island of Hawaii.

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Zimmerman, E. C. 1948. Insects of Hawaii 5:141–276. University of Hawaii Press.

Additions to the Known Insect Fauna of Niihau

J. W. Beardsley

EXPERIMENT STATION, HSPA
HONOLULU, HAWAII

AND

L. D. Tuthill

DEPT. OF ZOOLOGY AND EMTOMOLOGY, UNIVERSITY OF HAWAII
HONOLULU, HAWAII

(Presented at the meeting of October 13, 1958)

Through the courtesy of Mr. Aylmer Robinson the junior author was enabled to spend a week on the island of Niihau during the month of August, 1947, for the purpose of making a survey of the insect fauna of that island. Because of the extremely dry condition of Niihau during the summer months, the collection secured undoubtedly represents only a portion of the insects present. Many additional species certainly could be collected during the wetter winter months.

We are grateful to D. E. Hardy for determination of the Diptera, E. J. Ford, Jr., for the Coleoptera, K. Sakimura for the Thysanoptera, C. M. Yoshimoto for certain of the aculeate Hymenoptera, E. S. Ross for the Embioptera, and Mrs. Betty Defibaugh Pelot for preparation of the scale insects. The remainder of the determinations were made by Beardsley.

The only previously published records of Niihau insects are those of Fullaway (Proc. Haw. Ent. Soc. 13 (1) :51–53, 1947) and Bonnet (Proc. Haw. Ent. Soc. 16 (3) :330, 1958). In the following list duplications of earlier records are in italics.

Odonata

Libellulidae
  Pantala flavescens (Fabricius)
Coenagrionidae
  Megalagrion sp.; one female

Orthoptera

Blattidae
  Cutilia soror (Brunner)
  Pycnoscelus surinamensis (L.)

Mantidae
Tenodera angustipennis Saussure (?); one ootheca
Tettigoniidae
Conocephalus saltator (Saussure)
Gryllidae
Metioche vittaticollis (Stål)

ISOPTERA

Kalotermitidae
Kalotermes immigrans Snyder

EMBIOPTERA

Oligotomidae
Oligotoma saundersii (Westwood)

THYSANOPTERA

Thripidae
Frankliniella sulphurea Schmutz; on *Hibiscus tiliaceus* flowers and *Sesbania tomentosa* flowers.
Taeniothrips hawaiiensis (Morgan) from **imitator** Priesner; on *Sesbania tomentosa* flowers.
Thrips tabaci Lindeman; on *Sesbania tomentosa* flowers
Phlaeothripidae
Haplothrips fusca Moulton; sweeping *Scirpus* sp. and *Batis maritima*.
Haplothrips gowdeyi (Franklin); on *Nototrichium sandwicense* flowers.

HEMIPTERA (HETEROPTERA)

Lygaeidae
Geocoris pallens Stål
Geocoris punctipes (Say)
Graptostethus manillensis (Stål)
Nysius communis Usinger
Nysius fucatus Usinger
Nysius kinbergi Usinger (see p. 92)
Nysius longicollis Blackburn
Pachybrachius nigriceps (Dallas)
Pachybrachius vincta (Say)
Tempyra biguttula Stål
Tingidae
Teleonemia scrupulosa Stål
Reduviidae
Zelus renardii Kolenati
Nabidae
Nabis blackburni White
Anthocoridae
Buchaniella sodalis (White)
Orius persequens (White)

Miridae
Hyalopeplus pellucidus (Stål)
Leucopoecila albofasciata Reuter
Psallus n. sp.; on *Myoporum sandwicense* (A. de Candolle) Gray
Veliidae
Microvelia vagans White
Notonectidae
Buenoa pallipes (Fabricius)
Corixidae
Trichocorixa reticulata (Guérin-Méneville)

HEMIPTERA (HOMOPTERA)

Cicadellidae
Balclutha hospes (Kirkaldy)
Deltocephalus hospes Kirkaldy
Draeculacephala mollipes (Say)
Nesophrosyne sp.; one poor specimen
Delphacidae
Aloha myoporicola Kirkaldy; on *Myoporum sandwicense*
Peregrinus maidis (Ashmead)
Diaspididae
Andaspis hawaiiensis (Maskell); on *Leucaena glauca*
Chrysomphalus ficus Ashmead; on orange, plum, and unknown host
Diaspis bromeliae (Kerner); on pineapple
Diaspis echinocacti (Bouché); on *Opuntia*
Duplaspidiotus claviger (Cockerell); on *Abutilon* and unknown host
Hemiberlesia lataniae (Signoret); on *Agave*
Howardia biclavis (Comstock); on *Abutilon*
Ischnaspis longirostris (Signoret); on *Pritchardia*
Pinnaspis strachani (Cooley); on *Hibiscus, Abutilon,* and unknown host
Pseudaulacaspis major (Corkerell); on unknown host.

NEUROPTERA

Hemerobiidae
Nesomicromus navigatorum (Brauer)

LEPIDOPTERA

Nymphalidae
Danaus plexippus (L.)
Lycaenidae
Lampides boeticus (L.)
Sphingidae
Herse cingulata (Fabricius)
Pyralididae
Hymenia recurvalis (Fabricius)
Tineidae
Petrochroa dimorpha Busck

Gelechiidae
Stoeberhinus testaceus Butler

COLEOPTERA

Carabidae
Tachys oahuensis Blackburn
Corynetidae
Necrobia rufipes (De Geer)
Elateridae
Melanoxanthus melanocephalus (Fabricius)
Simodactylus cinnamomeus (Boisduval)
Dermestidae
Dermestes maculatus DeGeer
Orphinus fulvipes (Guérin-Méneville)
Nitidulidae
Carpophilus dimidiatus (Fabricius)
Coccinellidae
Coelophora inaequalis (Fabricius)
Cryptolaemus montrouzieri Mulsant
Curinus coeruleus Mulsant
Rhizobius ventralis (Erichson)
Rodolia cardinalis (Mulsant)
Scymnus bilucernarius (Mulsant)
Scymnus (?) sp.; one specimen
Oedemeridae
Sessinia bicolor (Fairmaire)
Tenebrionidae
Alphitobius diaperinus (Panzer)
Blapstinus dilatus Leconte
Eutochia lateralis (Boheman)
Gonocephalum adpressiforme Kaszab. This species previously reported as *G. seriatum* (Boisduval) by Fullaway
Lobometopon diremptus (Karsch)
Platydema obscurum Sharp
Scarabaeidae
Aphodius lividus (Olivier)
Cerambycidae
Ceresium unicolor (Fabricius)
Prosoplus bankii (Fabricius)
Xystrocera globosa (Olivier)
Chrysomelidae
Diachus auratus (Fabricius)
Bruchidae
Acanthoscelides obtectus (Say)
Bruchus amicus Horn

Bruchus pruininus Horn
Megacerus alternatus (Bridwell)
Curculionidae
Oxydema fusiforme Wollaston
Pantomorus godmani (Crotch)
Scolytidae
Xyleborus testaceous (Walker)
Anthribidae
Araecerus vieillardi (Montrouzier)

HYMENOPTERA

Braconidae
Apanteles marginiventris Cresson
Chelonus blackburni (Cameron)
Meteorus laphygmae Viereck (?); one poor specimen
Phanerotoma hawaiiensis Ashmead
Ichneumonidae
Casinaria infesta Cresson (?); one poor specimen
Idechthis canescens (Gravenhorst)
Eulophidae
Horismenus sp.
Evaniidae
Evania appendigaster (L.)
Bethylidae
Epyris extraneus Bridwell
Holepyris hawaiiensis (Ashmead)
Formicidae
Camponotus variegatus hawaiiensis Forel
Cardiocondyla sp.; one male
Pheidole megacephala (Fabricius)
Ponera perkinsi Forel
Vespidae
Pachodynerus nasidens (Latreille)
Polistes fuscatus aurifer Saussure
Polistes macaensis (Fabricius)
Polistes olivaceus (DeGeer)
Odynerus niihauensis Yoshimoto (see pp. 126–127)
Sphecidae
Pison hospes Smith
Pison iridipennis Smith
Sceliphron caementarium (Drury)
Trypoxylon bicolor Smith
Colletidae
Nesoprosopis anthracina (Smith)
Apidae
Apis mellifera L.
Xylocopa varipuncta (Patton)

DIPTERA

Culicidae
Aedes albopictus (Skuse)
Dolichopodidae
Asyndetus carcinophilus Parent
Syrphidae
Lathyrophthalmus aeneus (Scopoli)
Toxomerus marginatus (Say)
Volucella obesa (Fabricius)
Ortalididae
Notogramma stigma (Fabricius)
Tephritidae
Dacus dorsalis (Hendel)
Callophoridae
Chrysomya megacephala (Fabricius)
Chrysomya rufifacies Macquart
Muscidae
Musca domestica L.

Recent Introductions for Biological Control in Hawaii—IV

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BOARD OF AGRICULTURE AND FORESTRY
HONOLULU, HAWAII

(Presented at the meeting of December 15, 1958)

This paper is primarily a check list of beneficial organisms released in Hawaii by the Board of Agriculture and Forestry, and the Hawaiian Sugar Planters' Association since the last published listing by the author (PROC. HAW. ENT. SOC. 16 (3) :356–358, 1958). The list of beneficial organisms is presented in the tables following the summary.

SUMMARY

The establishment of introduced organisms may often take a year or more under Hawaiian conditions, and thus precludes appraisal of 1958 introductions at this time. *Canthon humectus* (Say), for example, was sent from Mexico to Hawaii by H. T. Osborn in 1923 for hornfly control but was not recovered until June 12, 1947 (PROC. HAW. ENT. SOC. 13 (2) : 212, 1948). This summary, therefore, pertains to noteworthy developments of some established organisms introduced prior to 1958 under the following respective categories:

I Snail Pest Control

Euglandina rosea (Ferrusac), the carnivorous snail from Florida, apparently has not reached a population peak, and continues to multiply spectacularly in most all African snail infested areas. Two other carnivorous snails, *Gonaxis kibweziensis* (Smith) and *Gonaxis quadrilateralis* (Preston), were present at nearly all release points surveyed, and had extended their ranges considerably.

II Plant Pest Control

A. *Lantana camara* L.

Syngamia haemorrhoidalis Guenée was, until recently, the only outstanding lepidopterous defoliator of lantana. This pyralid was introduced from Florida in 1956 and became established rapidly throughout the major islands of the Hawaiian Group. At Mokuleia, Oahu, in 1957, destruction to lantana foliage was close to one hundred per cent and was comparable to seasonal devastation caused by the tingid, *Teleonemia scrupulosa* Stål.

NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII

Pest Needing Control	Organism Introduced	Source	Collector	Date Rel'd. (1958)	No.	***Release Point
I SNAIL PESTS						
Achatina fulica Bowdich (giant African snail)	*Damaster blaptoides blaptoides* Kollar	Fukuoka, Japan	N.L.H. Krauss	Jul 3	50	Kionaole Road (Old Pali Road) Oahu
		Fukuoka, Japan	N.L.H. Krauss	Jul 9	25	Haiku, Maui
	Damaster blaptoides rugipennis Motchulsky	Sapporo, Hokkaido, Japan	N.L.H. Krauss	Jul 28	46	Tantalus, Oahu
	**Lamprophorus tenebrosus* (Walker)	Kandy, Ceylon	N.L.H. Krauss	Oct 15	256	Waiahole, Oahu
		Kandy, Ceylon	N.L.H. Krauss	Oct 27	56	Pauwela Gulch, Maui
Subulina octona Bruguiere (conical snail)	**Gulella bicolor* Hutton	Saipan	N.L.H. Krauss	Mar 28	9	Pauoa Valley, Oahu
		Kuala Lumpur, Malaya	N.L.H. Krauss	Sept 10	600	Hilo, Hawaii
Lymnaea ollula Gould (liver fluke snail)	*Sepedon macropus* Walker	Nicaragua	Dr. C. Berg	Dec 5	8	Kahaluu Swamp, Oahu
II PLANT PESTS						
Melastoma malabathricum L.	*Bocchoris fatualis* Munro	Paete, Laguna Province, Philippine Island	N.L.H. Krauss	Mar 13	58	Knudsen Gap, Kauai
				Apr 10	40	Ainako, Hawaii
Ulex europaeus L.	**Apion* sp.	Montachique, Portugal	C. J. Davis	Jul 9	130	Olinda, Maui
Lantana camara L.	**Aerenicopsis championi* Bates	Vera Cruz, Mexico	Ing. Eleazar Jimenez	June 9	38	Tantalus, Oahu
				June 6	10	Kona, Hawaii

* Previously introduced

NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII (Cont'd)

Pest Needing Control	Origanism Introduced	Source	Collector	Date Rel'd. (1958)	No.	***Release Point
III INSECT PESTS						
Aphis gossypii Glover	**Coelophora inaequalis* (Fabricius)	Manila, Philippines	N.L.H. Krauss	Mar 14	187	Damon Tract, Oahu
	Scymnus sp.	Manila, Philippines	N.L.H. Krauss	Mar 11	18	Damon Tract, Oahu
	Verania crocea (Mulsant)	Manila, Philippines	N.L.H. Krauss	Mar 14	52	Damon Tract, Oahu
		Manila, Philippines	N.L.H. Krauss	Mar 24	700	Waiakeawaena, Hilo, Hawaii
		Manila, Philippines	N.L.H. Krauss	Mar 24	400	Wailuku, Maui
		Manila, Philippines	N.L.H. Krauss	Mar 24	500	Hanapepe & Lawai Valley, Kauai
		Manila, Philippines	N.L.H. Krauss	Mar 17	100	Makaha Valley Road Oahu
	**Synonyche grandis* Thunberg	Okinawa, Ryukyu Is.	N.L.H. Krauss	June 6	33	Makiki Heights, Oahu
Aphis spp.	*Verania* sp. *Coelophora* sp.	Zamboanga, Mindanao, Philippines	N.L.H. Krauss	Dec 9	40	Makiki, Oahu
Mealybugs	*Scymnus* sp.	Calcutta, West Bengal	N.L.H. Krauss	Nov 7	155	Corner Young & Keeaumoku Sts., Oahu
		Calcutta, West Bengal	N.L.H. Krauss	Nov 7	125	Mokulua Dr., Lanikai, Oahu
	**Scymnus roepkei* Fluiter	Manila, Philippines	N.L.H. Krauss	Mar 17	25	Makaha Valley Rd., Oahu
	Encyrtidae sp.	Calcutta, West Bengal	N.L.H. Krauss	Nov 20	15	Corner Young & Keeaumoku Sts., Oahu
	**Aenasius advena* Compere	Manila, Philippines	N.L.H. Krauss	Dec 29	30	Nuuanu Valley, Oahu

* Previously introduced

* Previously introduced

NEW INTRODUCTIONS AND ADDITIONAL RELEASES FOR BIOLOGICAL CONTROL IN HAWAII (Cont'd)

Pest Needing Control	Organism Introduced	Source	Collector	Date Rel'd. (1958)	No.	***Release Point
III INSECT PESTS (Cont'd)						
Protaetia fusca (Herbst) (scarab beetle)	*Tiphia paralella* Smith	Mauritius	A. Moutia	Jan 17	30	H.S.P.A., Oahu
Siphona irritans L. (hornfly)	Scarabaeidae, Undetermined	Iran	E. Esfandiari	June 2	50	Kualoa Ranch, Oahu
	******Pachylister lutarius* Erichson	Ceylon	N.L.H. Krauss	Sept 28	4	University of Hawaii Dairy, Oahu
	******Hister javanicus*, Paykull	Ceylon	N.L.H. Krauss	Sept 29	10	University of Hawaii Dairy, Oahu
	******Pachylister chinensis* Quenstedt	Ceylon	N.L.H. Krauss	Oct 6	7	Foremost Dairy (Campos), Oahu
	******Santalus orientalis* Paykull	Ceylon	N.L.H. Krauss	Oct 6	7	Foremost Dairy (Campos), Oahu
Aspidiotus spp. (scale pests)	*Chilocorus nigritus* (Fabricius)	Chilaw, Ceylon	N.L.H. Krauss	Oct 13	12	Foster Gardens, Oahu
Hedylepta accepta (Butler) (sugar cane leafroller)	*Litomastix* sp.	Fiji	B.A. O'Connor	Mar '58		Aiea, Oahu; Mt. View, Hawaii

* Previously introduced
** Determined by Dr. R. L. Wenzel
*** Applies to initial releases only.

During the latter part of the year another lantana defoliator, *Hypena jussalis* Walker, became established on Hawaii, Oahu, and Maui. Subsequently, Mr. Stephen Au, Resident Entomologist on Kauai, reported "explosions" of *Hypena* populations in Lawai Valley during October and November, 1958. This noctuid moth was introduced from Diani Beach, Kenya Colony and Umtali, Southern Rhodesia, in 1957.

Enemies of *Syngamia* and *Hypena* in Hawaii include *Pachodynerus nasidens* (Latrielle) and *Polistes* sp.

B. *Emex australis* Steinh.

Apion antiquum Gyllenhal, introduced from Durban, South Africa in January, 1957 was reported established on the Parker Ranch at Kamuela, Hawaii, by Harold Baybrook, Ranch Agriculturist, in October, 1958. The larvae of this weevil are stem borers and the adults feed on the leaves and flowers.

C. *Schinus terebinthifolius* Raddi (Christmas berry)

Episimus sp., an olethreutid moth introduced from Brazil in 1954, is established and widespread on all major islands. The larvae are leafrollers. The principal enemy of this species appears to be *Pachodynerus nasidens.*

III Insect Pest Control

No significant developments were observed.

The propagation and testing of all organisms considered for liberation were conducted by Mr. Q. C. Chock, Territorial Entomologist, assisted by Miss Mabel Chong, Insectary Supervisor.

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A New Species of Acrapex (Lepidoptera: Noctuidae) from Hawaii

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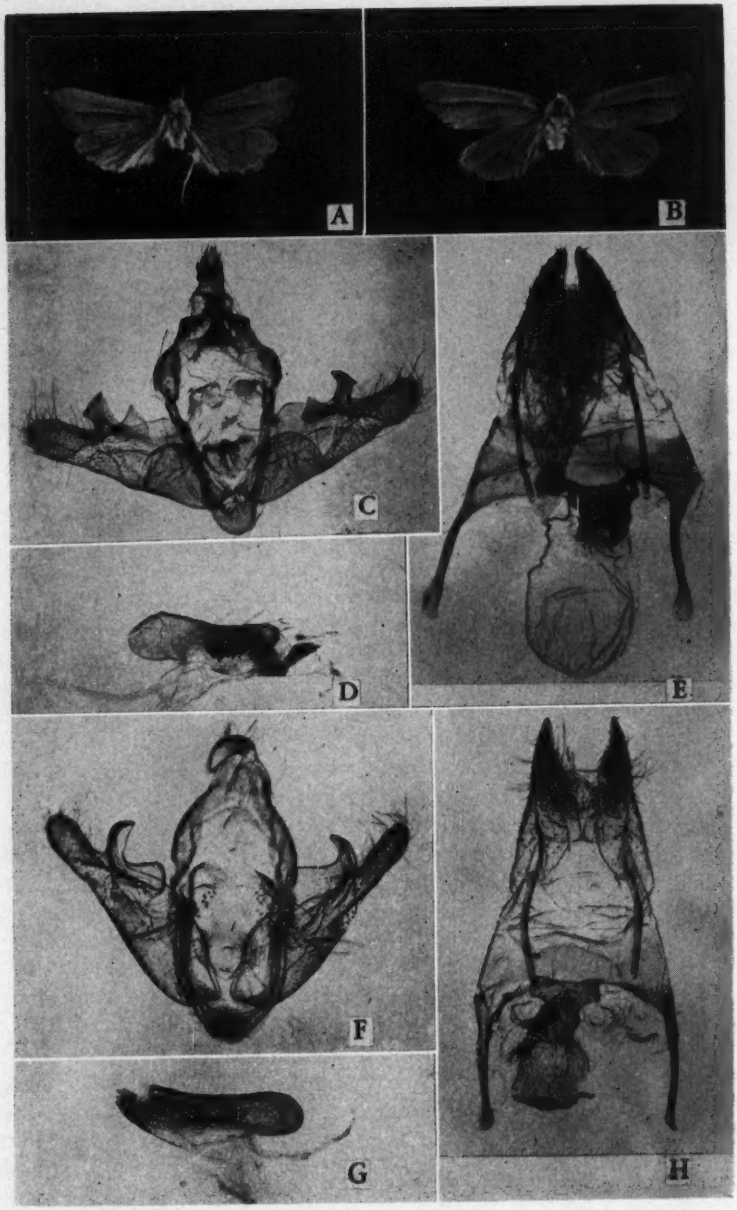
(*Presented at the meeting of June 9, 1958*)

Acrapex mischus, new species (fig. 1, A-E)

Male 28.5 mm.; female 30-33 mm. Male antenna bipectinate, longest pectinations in medial three-fifths equal in length to twice diameter of shaft; pectinations reducing in length in apical and basal fifths. Female antenna sparsely ciliate. Palpus in each sex equal in length to one and one-half times diameter of eye. Veins R_5 and M_1 on hind wing connate or approximate. Palpus, frons, vertex, thorax and abdomen cartridge buff mixed with drab and fuscous, vertex and thorax very long-scaled. Fore wing light buff; medial three-fifths of discal fold, distal four-fifths of submedial fold and all veins white, edged to a varying degree with fuscous in the female; in the male only the cubitus is so edged; in one female there are two fuscous spots in the submedial fold, one at one-third and one at two-thirds; termen slenderly black; inner margin lightly irrorate with fuscous; fringe white proximally, white irrorate with fuscous distally. Underside white; costal and cubital areas lightly suffused with drab in the female; in the male these areas and the veins are darkly drab. Hind wing white; in the male the termen is slenderly drab. Underside similar; in the male the costal area is lightly suffused with drab.

Genitalia: Male; uncus narrowed at base, bilobate at apex. Juxta with small, ventral, bulbous projection. Valve and aedeagus as illustrated. Female; as illustrated.

Differs superficially from *Acrapex exanimis* (Meyrick, 1899) (fig. 1, F-H) in its larger size, slender black termen and proximally white fringe to the fore wing. Differs structurally in the neuration of the hind wing, veins R_5 and M_1 being connate or approximate (these veins are stalked in *exanimis*); in the bilobate instead of tapered uncus, the better developed juxtal projection and the cornuti in the male genitalia; in the


A
B
C
D
E
F
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H

broader lobes of the ovipositor, the broader tips to the anterior apophyses, the differently shaped ductus bursae and in the presence of lightly sclerotized ribbing at the neck of the bursa copulatrix in the female genitalia.

Holotype male and allotype female: Aina Haina, Oahu, Hawaiian Islands, in light trap, March, 1957 (J. W. Beardsley), in coll. Experiment Station, Hawaiian Sugar Planters' Association, Honolulu. One female same data as type; and one female same locality and collector, Dec. 28, 1956, in British Museum (Natural History).

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Fig. 1. A, *Acrapex mischus*, n. sp., holotype male; B, allotype female; C, male genitalia; D, aedeagus; E, female genitalia; F, *Acrapex exanimis* Meyrick, male genitalia; G, aedeagus; H, female genitalia.

Host Relations and Distribution of New Guinea Hispine Beetles[1]

J. L. Gressitt

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(Presented at the meeting of December 15, 1958)

The hispine beetles constitute an economically important subfamily of the leaf-beetles (Chrysomelidae) which present interesting problems from the standpoint of distribution and host relations. In general the beetles are limited in host range, and feed on particular genera or families of Monocotyledonae. They are tropical, and do not extend high in the mountains. For the most part, their habits are secretive, and in New Guinea they are rarely found by the general collector, or even one who does extensive sweeping of vegetation for leaf-feeding insects.

Maulik (1937) treated the host relationships of the hispine beetles from the world standpoint, but much more is now known on the subject. Kalschoven (1957) brought the subject up to date for the Orient, presenting an interesting discussion on host preference. The South Pacific fauna in the subfamily was reviewed (Gressitt, 1957) with many new host records, and the distribution discussed again (Gressitt, in press). Since then, a number of additional species and host records have been accumulated for New Guinea. It is thus now possible to discuss in a rough way the hosts and distribution on a generic basis for that island. Many gaps still exist, however, so a more conclusive discussion must come later. Since a number of the new species are not yet described, no reference will be made to species names. The discussion will be limited to New Guinea and adjacent islands, including the Bismarck Archipelago, with occasional reference to hosts of Solomon Islands representatives of genera occurring in New Guinea.

Host Relations

Most of the genera of hispines in New Guinea belong to the more primitive tribes of spineless forms which, at least here, feed entirely on monocotyledons. Half of the non-spiny genera belong to the tribe Cryptonychini, which is fairly primitive, and which seems to be largely limited

[1] Partial results of the project "Zoogeography and Evolution of Pacific Insects", supported in part by a grant from the National Science Foundation.

to the Palmae. If Hutchinson (1934) is followed, the more primitive hispines seem to be mainly attached to the more primitive plants and have limited host ranges, and the more specialized hispines seem to have slightly wider host ranges, including higher plants in some cases. Thus there appears to be a correlation between the phylogeny of the beetles and the phylogeny of their hosts, as appeared to be the case in the closely related subfamily Cassidinae (Gressitt, 1952). The spiny hispines are the most specialized. In New Guinea, of the four genera of spiny hispines, two (*Hispellinus* and *Dicladispa*) seem to be limited to the Gramineae and two (*Dactylispa* and *Platypria*) may attack dicotyledons, although the local hosts have not been determined. The hosts of *Dactylispa* and *Platypria* in southeast Asia include some dicotyledons, and careful searching of monocotyledons in New Guinea has failed to produce evidence of these two genera.

Most of the New Guinea forms, and particularly the more primitive ones, live in hidden environments, at least in the immature stages. The larval niches include (1) petiole-bases of palm fronds (between petiole-base and trunk), particularly or rattans; (2) folded leaflets of new palm fronds (including leaflets not properly opened because of entwined vines, rattan, tendrils, etc.); (3) base of crowns of monocots (Araceae, Pandanaceae, Cyperaceae, Gramineae); and (4) mines within leaves (Palmae, Pandanaceae, Cyperaceae, Gramineae, Zingiberaceae, and rarely Dicotyledonae). For the first category, the adults are often found on new fronds, and sometimes in the second larval niche. Adults of the second and third categories are generally found with the larvae, and adults of the fourth category on the under surfaces (*Promecotheca*, some Hispini) or upper surfaces (most of the other miners) of the open leaflets. Thus it is seen that the more primitive eight genera occur in the first three niches and the more advanced eight genera are probably all leaf-miners.

In general, a species of hispine is limited to one genus or family of plants, but a genus of hispines may have more than one family among the hosts of its species.

The known hosts (with some abridgement among the palms) are indicated in Table I. The numbers refer to the larval niches, as indicated in the preceding paragraph.

Distribution

As already shown (Gressitt, in press), the faunae of the Old and New Worlds in this group are generically and tribally mutually exclusive. Host limitation in relation to the Bering connection as a filter bridge is assumed to bear on this. Furthermore, the Papuan fauna, though having some endemic genera (asterisked on Table I), is primarily related to the Malayan and Philippine faunae, and is thus Oriental. Only one true Australian genus (*Eurispa*) occurs in New Guinea, and it has been

found only in the Territory of Papua (SE New Guinea).

Within New Guinea, the known distribution of the various genera relates primarily to the extent of special searching, most of which has been along the northern coast, in Papua, and in a few interior highland areas. Searching in other areas will show that many of the genera are widely distributed over the island. The Bismarck Archipelago has some endemic genera and species (Gressitt, 1957). The distribution for the various genera, as far as known, is indicated on the map by abbreviations showing records.

TABLE 1. Hosts of New Guinea Hispinae

	MUSACEAE	ARACEAE	ZINGIBERACEAE	PALMAE							PANDANACEAE		CYPERACEAE	GRAMINAE		DICOTYLEDONS
				Nypa	Metroxylon	rattans	Cocos	Rhopaloblaste	Areca	other palms	Pandanus	Freycinetia		canes	grasses	
CALLISPINI																
Hispodonta					1											
EURISPINI																
Eurispa													3?		?	
CRYPTONYCHINI																
Octodonta						2			2							
Brontispa							2	2		2						
Plesispa							2	2		2			3	3	3	
**Ceratispa*					1	1		1								
**Oxycephala*						1	1									
Callistola		(3)									3	3				
COELAENOMENODERINI																
**Enischnispa*						4?										
PROMECOTHECINI																
Promecotheca			(4)	4	4		4		4	4	4	4		(4)	(4)	
GONOPHORINI																
**Aspidispa*						4				4						
Gonophora	4		4													
HISPINI																
Hispellinus															4	
Dactylispa																?4
Dicladispa															4	
Platypria																?4

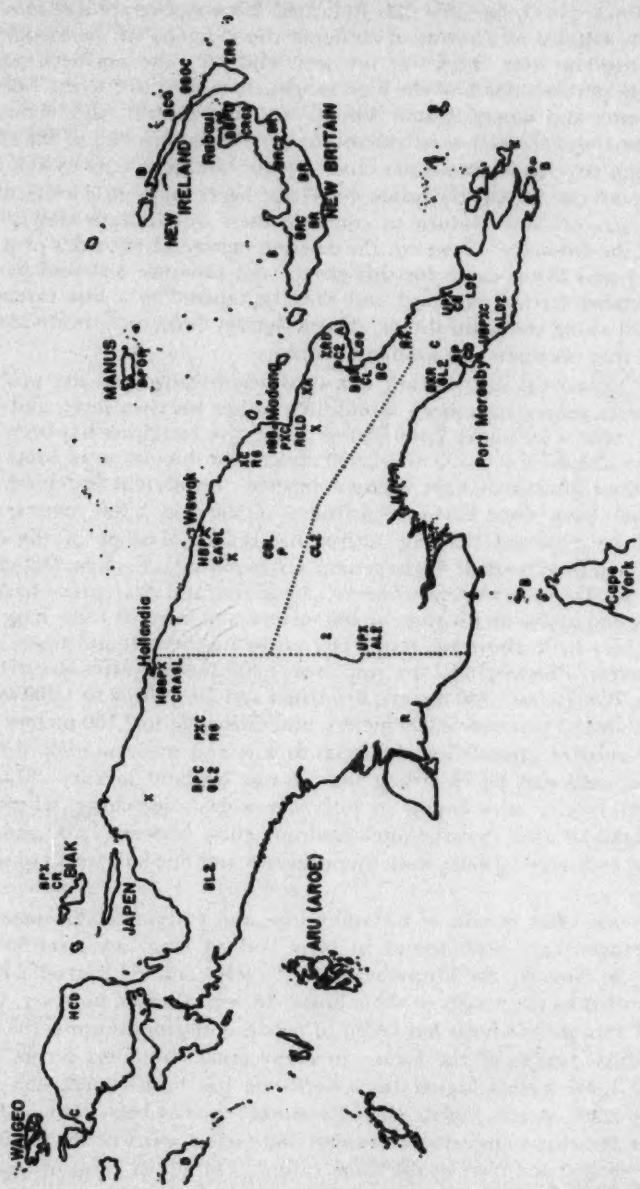
Note: Numbers refer to larval niche. Asterisk indicates genus is endemic to the Papuan Subregion. Parentheses indicate hosts of Solomon Island species. Question mark after number indicates uncertainty as to niche and question mark before number indicates questioned host.

Lieftinck (1949, fig. 288) has indicated five zoogeographical provinces for New Guinea as a result of studying the Odonata of the island: (1) The Vogelkop and "neck" at the west end, (2) the northern part of the main portion, north of the high ranges, extending east to the Adelbert Mountains and upper Ramu Valley, (3) the central high mountain areas for the same west–east extension, (4) the eastern end of the island, including the Huon Peninsula, and (5) the southern part of the main portion of the island. Hispines have not been sufficiently collected in some parts of New Guinea to compare their distribution closely with that of the Odonata. However, the division between Lieftinck's provinces 2 and 4 may break down for this group, and province 3 should perhaps be extended farther eastward and then be tapered to a line extending eastward along the main divide (Owen Stanley Mts., etc.) to divide province 4 into northern and southern portions.

The altitudinal distribution is a conspicuous aspect of the problem, for several genera have been found only rather near sea level, and there are no records for above 2,100 meters. Intensive searching has been done between altitudes of 1,500 and 2,000 meters and higher, so in some areas the highest limits may have been established. Insufficient searching, however, has been done between altitudes of 500 and 1,500 meters, so it should be expected that the altitudinal ranges of some of the other genera will be extended. Eight genera (*Hispondonta, Eurispa, Octodonta, Ceratispa, Oxycephala, Enischnispa, Aspidispa,* and *Platypria*) have not been found above an altitude of 400 meters, and some of these have been found very little above sea level. *Dactylispa* has been found up to about 700 meters, *Promecotheca* to just over 1,000 meters, *Micrispa* to 1,360 meters, *Plesispa* to 1,480 meters, *Brontispa* and *Diciadispa* to 1,700 meters, *Hispellinus* to just over 2,000 meters, and *Callistola* to 2,100 meters.

The relative abundance of species at low and medium-high altitudes may be suggested by recording that in one lowland locality (Maprik) thirteen species were found in just over a day's searching, whereas in one highland area (Swart Valley environments) between 1,200 and 2,000 meters, only eight species were found in two and one-half weeks of searching.

Whereas some genera of Cerambycidae and Chrysomelidae with wide host ranges have been found in New Guinea from sea level to 3,600 meters in altitude, the Hispinae, being largely confined to tropical hosts, are limited to the ranges of these hosts. In several cases, however, searching of appropriate hosts has failed to produce hispines towards the upper altitudinal ranges of the hosts. In many areas *Pandanus* occurs up to nearly 1,000 meters higher than *Callistola* has been found, and up to nearly 2,000 meters higher than *Promecotheca* has been found. In one area a *Brontispa* appeared to extend 400 meters short of the altitudinal range of its palm host in the same valley. The upper limit of *Ceratispa* appears to be far short of that of its rattan hosts. Some of the other


NEW IRELAND
Rabaul
NEW BRITAIN
MANUS
Wewak
Hollandia
Port Moresby
Cape York
JAPEN
ARU (AROE)
WAIGEO
BIAK

genera do not have enough collection records to justify generalizations, but seem to be in the same category as *Ceratispa*. These facts seem to suggest that the hispine beetles are less tolerant of cold than their hosts. It is interesting that in several cases (*Brontispa* of two species in different hosts, *Callistola* of several species, a *Plesispa*, a *Promecotheca*, an *Hispellinus*, and a *Dicladispa*) hispines have been found most abundant in individuals of a species at or near their upper altitudinal limits. Competition or enemies may be factors in such cases.

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Lieftinck, M. A., 1949. The dragonflies (Odonata) of New Guinea and neighbouring islands. Nova Guinea (n.s.) 5: 1–271 (see fig. 288, p. 239).

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Fig. 1. Map of New Guinea and the Bismarck Archipelago, showing collection areas of the various hispine genera, as indicated by the following abbreviations:

Hispodonta	- H	Callistola	- C	Dicladispa	- 2
Eurispa	- U	Enischnispa	- E	Platypria	- T
Octodonta	- 8	Promecotheca	- R		
Brontispa	- B	Aspidispa	- A		
Plesispa	- P	Gonophora	- G		
Ceratispa	- X	Hispellinus	- L		
Oxycephala	- O	Dactylispa	- D		

A Review of the Genus Pseudiastata Coquillett (Drosophilidae, Diptera)

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(Presented at the meeting of July 14, 1958)

The members of the genus *Pseudiastata* are allied to the genus *Gitonides* Knab because of the pubescent arista; the large bare eyes; the presence of three pairs of strong orbital bristles; the presence of prescutellar acrostichals; by having the two pairs of dorsocentral bristles rather close together on the hind portion of the mesonotum; by the concave occiput; by the densely setose mesonotum; and by the short, broad scutellum. Also, like *Gitonides,* all of the known species of *Pseudiastata* are mealybug predators, and are of considerable importance as biological control agents. *Pseudiastata* differ from *Gitonides* by lacking brown spots over the mesonotum and front; by lacking a distinct crossvein between cells 1st M2 and M; by the maculated wings (figs. 1A and 2A); by having the third section of the costa five to six times longer than the fourth section; and by the very different male genitalia. The male genitalia of *Pseudiastata* lack claspers and the ninth tergum is usually distinctly lobate at ventral apices (figs. 1E and 2B). In *Gitonides* well developed, heavily spined claspers are present, and the ninth tergum is broad and not lobate. In *Pseudiastata* the postocellar and prescutellar bristles are also much more strongly developed than in *Gitonides.* The wings are marked with transverse brown to black marks in *Pseudiastata* (figs. 1A and 2A), whereas the wings of *Gitonides* are hyaline.

Pseudiastata specimens were purposely introduced into the Hawaiian Islands between 1924 and 1937 in an attempt to establish natural enemies of pineapple mealybugs (*Dysmicoccus brevipes* (Cockerell)). Refer to Fullaway (1933, Hawaii. For. Agric. 30:57), Carter (1935, Jour. Econ. Ent. 28:1039–40). Specimens were introduced by the Pineapple Research Institute and by the Hawaiian Board of Agriculture and Forestry from the Panama Canal Zone, Guatemala, British Guiana, and Brazil. These were all treated in the literature as *P. nebulosa* Coquillett, but actually none was this species. As pointed out by Sabrosky (1951, Bull. Ent. Res.

[1] Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Technical Paper No. 427.

41 (3) :625), the specimens from Panama were *P. pseudococcivora* Sabrosky. He also said the latter "may also have been the species reported by Carter (1935) as very abundant throughout Guatemala except in the highlands, feeding voraciously on the same species of mealybug" (*Dysmicoccus brevipes*). I have studied this material and the specimens from Guatemala are *P. pseudococcivora,* as also are some of the specimens from Brazil. Most of the specimens from Brazil were *P. brasiliensis* Costa Lima. The specimens introduced from British Guiana were apparently *P. vorax* Sabrosky, which has been previously known only from Trinidad. Dr. Walter Carter, Pineapple Research Institute, said the specimens from British Guiana failed to establish a colony in the laboratory and they were not released in the field.

To date, all of the known species of *Pseudiastata,* except for the type of the genus, *P. nebulosa* Coquillett, and *P. armata* Wheeler, have been recorded preying only upon pineapple mealybugs. J. W. Beardsley, Hawaiian Sugar Planters' Association, is convinced that what has been treated in the literature as *Dysmicoccus brevipes* (Cockerell) may actually represent a complex of species (he has thus far demonstrated two species from Micronesia and Hawaii) and this may possibly account for the failure to establish these flies in Hawaii, although other mealybug predators, such as *Gitonides perspicax* Knab, are general mealybug feeders showing no specificity.

Pseudiastata are robust flies, predominantly yellow to rufous in ground color, dusted with gray. All of the bristles are yellow; two strong bristles are present on the upper portion of each sternopleuron. The mesonotum is densely setulose; the acrostichals are arranged in ten to twelve rows. The labella are small and are densely covered with long yellow hairs. The palpi are short and broad and lack strong bristles. The patterns of the wing maculations are of two distinct types: *P. brasiliensis* Costa Lima is readily differentiated from other species by the presence of numerous transverse marks through cells R5 and 1st M2 (fig. 1A). All of the other known species appear to have nearly identical wing venation and wing markings, as in figure 2A, and can be differentiated only by the characteristics of the male genitalia. The male genitalia are distinctively developed in *Pseudiastata.* The anal plates are large and densely haired. The ninth tergum is lobate ventrally, except in *brasiliensis* which has the ventral margins of the tergum evenly rounded (fig. 1B). The shape and development of the ventral aspects of the tergum is useful for separating the species. The posterolateral margins of the ninth sternum each have a pair of lobes of varying shapes, depending upon the species, and the median margin is developed into a pair of slender lobes. The latter are paramere-like in appearance but they arise from the sternum. These lobes extend ventrad to the aedeagus and reach almost to the apices of the ventral lobes of the tergum. The presence or absence, and also the arrangement, of setae on the ninth sternum is also of diagnostic import-

ance, as brought out in the key and figures below.

KEY TO KNOWN SPECIES OF PSEUDIASTATA

1. Wings with three irregular transverse streaks of brown as in figure 2A. Ninth tergum of male lobate ventrally 2
   Cells R5 and 1st M2 with numerous streaks of brown as in figure 1A. Ventral aspects of ninth tergum broad, rounded, not distinctly lobate (fig. 1B). Ninth sternum as in figure 1C. (Brazil) ..... **brasiliensis** Costa Lima

2. Base of vein R4 + 5 bare 3
   Base of vein R4 + 5 setose. (Panama) ..... **armata** Wheeler

3. Ninth sternum of male with three bristles on each side, the posterolateral lobes not divided 4
   Ninth sternum devoid of bristles, each posterolateral lobe divided at the apex (fig. 2C). Lobes of ninth tergum as wide as long (fig. 2B) (Panama, Guatemala, Mexico, and Brazil—probably widespread over the Neotropical region). ..... **pseudococcivora** Sabrosky

4. Bristles on the ninth sternum situated near the apices of the posterolateral lobes (fig. 1E). Ventral aspects of ninth tergum rounded apically and curved upward (fig. 1D). (Eastern North America) ..... **nebulosa** Coquillett
   Bristles of ninth sternum extending to below middle of segment (fig. 2E). Ventral aspects of sternum pointed apically and not curved (fig. 2D). (Trinidad, British Guiana) ..... **vorax** Sabrosky

Pseudiastata armata Wheeler

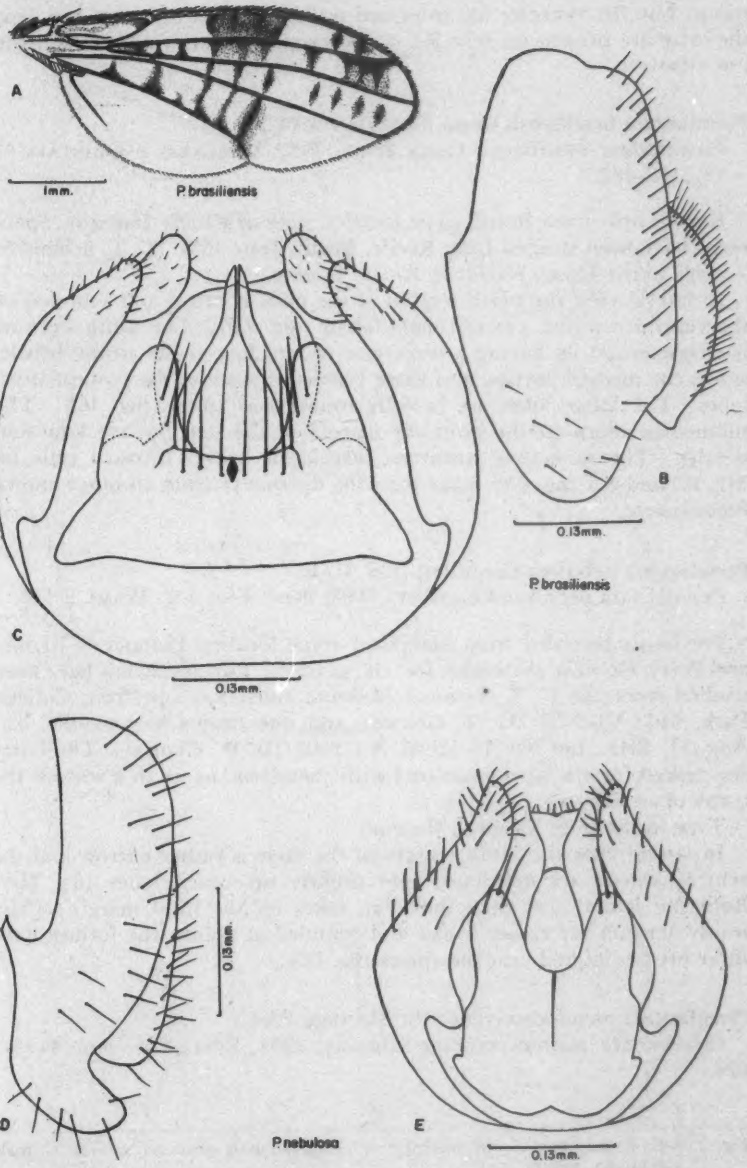
Pseudiastata armata Wheeler, 1957, UNIV. OF TEXAS PUB. 5721:111.

Known only from the type female and one female paratype collected at Mojinga Swamp, Ft. Sherman, Canal Zone. I have not seen this species.

Type in the U. S. National Museum.

This species is readily differentiated from other known *Pseudiastata* by having the basal section of vein R4 + 5 setose. The original figure of the

Fig. 1. A-C, *Pseudiastata brasiliensis* Costa Lima: A. wing; B. male genitalia, lateral view; C. male genitalia, ventral view.
D-E, *P. nebulosa* Coquillett: D. male genitalia, lateral view; E. male genitalia, ventral.


A
1mm.
P. brasiliensis
B
0.13mm.
P. brasiliensis
C
0.13mm.
D
0.13mm.
P. nebulosa
E
0.13mm.

wing (*loc. cit.* fig. 25) shows setae along the basal section of the radial sector, but Dr. Wheeler has informed me that this is incorrect and that the setae are present on vein R4 + 5 between the forking of Rs and the r-m crossvein.

Pseudiastata brasiliensis Costa Lima (figs. 1A-C)

Pseudiastata brasiliensis Costa Lima, 1937, Chacaras e Quintaes 55 (2):179–182.

Known only from Brazil (type locality, state of Rio de Janeiro). Specimens have been studied from Recife, Brazil, June 1937 (C. T. Schmidt).

Type in the Museu Nacional, Rio de Janeiro.

In lateral view the ninth tergum of the male is broad and rounded on the ventral margins, not distinctly lobate (fig. 1B). The ninth sternum is characterized by having a transverse row of four to six strong bristles across the median portion and three bristles on each of the posterolateral lobes. The latter lobes are broadly rounded at apices (fig. 1C). The submedian lobes on the posterior margin of the sternum are long and slender. The numerous transverse streaks of brown through cells 1st M2, R5 and R3 (fig. 1A) make the wing distinctive from all other known *Pseudiastata*.

Pseudiastata nebulosa Coquillett (figs. 1D-E)

Pseudiastata nebulosa Coquillett, 1908, Proc. Ent. Soc. Wash. 9:148.

Previously recorded from Maryland (type locality, Plummer's Island) and Perry, Georgia (Sabrosky, loc. cit., p. 624). Two specimens have been studied from the U. S. National Museum collection, one from College Park, Md., VI–9–35 (C. T. Greene) and one from Charlottsville, Va. Aug. 31, 1945. Lot No. 46–12046, No. 2007 (D. W. Clancy). The latter was reared from a larva associated with *Pseudococcus* sp. in a scar on the trunk of an oak tree.

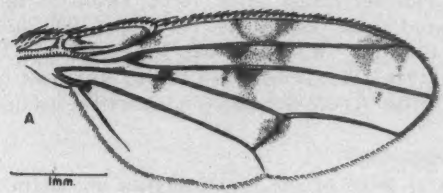
Type in the U. S. National Museum.

In lateral view the ninth tergum of the male is rather narrow and the ventral aspects are developed into slightly up-curved lobes (fig. 1D). Both the lateral and the submedian lobes on the hind margin of the ninth sternum are rather broad and rounded at apices; the former have three bristles located near the apices (fig. 1E).

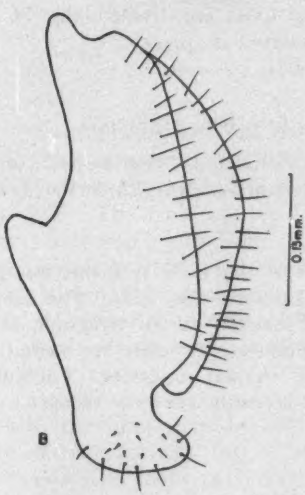
Pseudiastata pseudococcivora Sabrosky (figs. 2A-C)

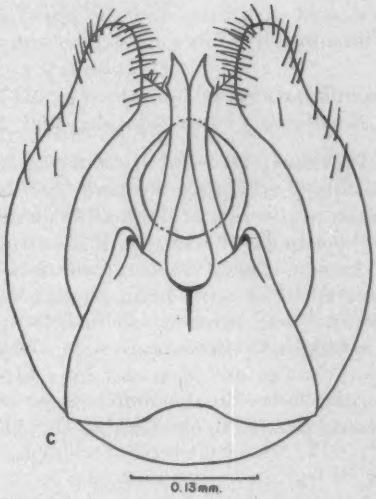
Pseudiastata pseudococcivora Sabrosky, 1951, Bull. Ent. Res. 41 (3): 624.

Fig. 2. A-C, *P. pseudococcivora* Sabrosky: A. wing; B. male genitalia, lateral; C. male genitalia, ventral.
D-E, *P. vorax* Sabrosky: D. male genitalia, lateral; E. male genitalia, ventral.

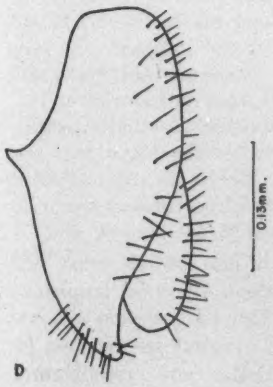


P. pseudococcivora

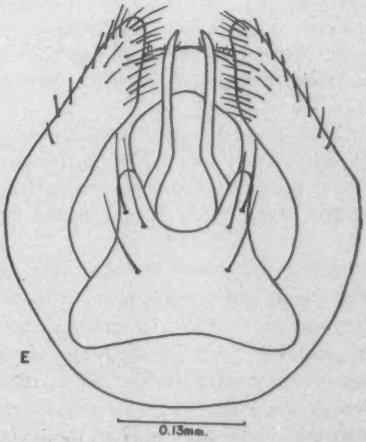




P. pseudococcivora



P. vorax



Previously recorded from Panama Canal Zone (type locality) and Mexico. Specimens are on hand from Guatemala, Nov.-Dec. 1932 and Jan. 1937 (W. Carter and E. G. Salas); Recife, Brazil, June 1937 (C. T. Schmidt); Bahia Brazil, Nov. 1946 (W. Carter) and "With shipment of mealybugs from Brazil", Nov. 1936 (C. T. Schmidt). I have also studied paratypes from Panama.

Type in the U. S. National Museum.

From lateral view the ventral lobes of the ninth tergum are slightly enlarged and are about as wide as long (fig. 2B). The ninth sternum is devoid of bristles and the posterolateral lobes are divided (fig. 2C). The submedian lobes are slender and are pointed at apices.

Pseudiastata vorax Sabrosky (figs. 2D-E)

Pseudiastata vorax Sabrosky, 1951, BULL. ENT. RES. 41 (3):625.

Previously recorded from River Estate, Trinidad, West Indies (type locality). Specimens on hand from British Guiana, Nov. 23, 1936 (E. G. Sales) apparently belong to this species.

Type in the U. S. National Museum.

From a lateral view the ninth tergum of the male is rather evenly tapered to an acute point on each ventral margin (fig. 2D). The ninth sternum has three rather widely spaced bristles in an irregular row longitudinally down each side. The posterolateral lobes are rounded apically and are separated by a broad 'U'-shaped concavity. The submedian lobes on the hind margin of the sternum are very slender and extend parallel to one another (fig. 2E).

Observations on Mango Weevil Infestations in 1957

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(Presented at the meeting of December 15, 1958)

The following observations were made on the mango weevil, *Sternochetus mangiferae* (Fabricius), in the course of chemical control studies in a mango grove in Robinson Gulch at Kunia near Wahiawa, Oahu, in 1957. The fruit was set during March, and there was only a single crop that year. Van Dine (2) first recorded the presence of the weevil in Hawaii in 1906, and stated that the life cycle was approximately 40 days with but one generation per year. Swezey (1) also studied its biology and examined numerous seeds for weevil infestation. He found weevils in nearly all the seeds, with 10-percent infestation in green mangoes as early as January.

In order to evaluate the effectiveness of chemical treatments to be applied, the infestation in 1181 mango fruits gathered from the ground at intervals between July 17 and September 3 was determined. The July 17 collection, made prior to the peak of crop production, showed 95 per cent infestation of seeds by 1 or more mango weevils (table 1). As the season advanced the number of infested fruits decreased, the September 3 collection showing only 41 per cent infestation. Decreases in the number of larvae and increases in the percentages of pupae and adults suggest that the heaviest weevil attack occurred early in the season before the first collection was made.

The number of individuals per infested seed ranged from 1 to 5, with single-individual infestation predominating (66.3 per cent) and 95.7 per cent of the infested seeds having either one or two individuals. Various combinations of larvae, pupae, and adults or all these stages together occurred in some of the seeds.

Over 99 per cent of the weevils in 1975 infested seeds collected during the same period and then held in the laboratory were adults when examined between December 16 and January 27, 1958. The mortality was 34 per cent by mid-December, 42 per cent by early January, and 56 per cent by January 27, in contrast to no mortality in seeds dissected immediately after collection. An examination of 40 old seeds nearly a year after collection (June 1958) showed 100 per cent mortality of the

adults in them.

TABLE 1. Mango seed weevil infestation in Robinson Gulch, Kunia, Oahu, in 1957.

Date	Mangoes		Total Number of Weevils	Per Cent of		
	Number Collected	Per Cent Infested		Larvae	Pupae	Adults
July 17	60	95	94	100	0	0
26	178	97	199	100	0	0
30	190	96	259	100	0	0
Aug. 1	114	94	145	100	0	0
6	134	83	148	62	35	4
8	45	78	59	66	32	2
12	124	89	175	43	47	10
19	146	77	166	32	37	31
26	151	64	131	21	20	60
Sept. 3	39	41	20	25	25	50

Rodents damaged many of the seeds on the ground under the trees to the point where no weevil could have survived. However, 29 per cent of these rodent-damaged seeds had emergence holes when examined on January 27, 1958, indicating escape of one or more adults prior to damage. The fact that 45 per cent of the seeds with no rodent damage had emergence holes suggests a slight degree of control by rodents. Moist conditions obviously are necessary for good weevil emergence, since adults emerged in the field but not in the laboratory.

LITERATURE CITED

(1) SWEZEY, O. H. 1922–52. Scientific notes. PROC. HAWAII. ENT. SOC. *5*:13; 7:385; *9*:8; *11*:270; *12*:14; *14*:11, 13.
(2) VAN DINE, D. L. 1906. The mango weevil. HAWAII AGR. EXPT. STA. PRESS BULL. 17, 11pp.

The Appearance of the Giant African Snail in Arizona

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(Presented at the meeting of July 14, 1958)

The giant African snail, *Achatina fulica* Bowdich, has recently made its deepest penetration into continental United States by showing up alive in the city of Mesa, Arizona, for a period of two weeks. The story behind its appearance is an all too familiar one in theme and brings to mind Pemberton's account of the origin of the Oahu infestation (HAWAIIAN PLANTERS' REC. 42 (2) :135–140, 1938) and Benson's account of the start of the Calcutta population (J. CONCHYL. 7:266–268, 1858).

Regrettably, the particulars of the introduction are hearsay; but this notwithstanding, they should be entered in the record if for no other reason than that they will serve to warn and remind that the ingredients for a successful introduction are simple and few.

A man and his young son from "somewhere in eastern United States" visited in Oahu during April, 1958. The young son became so fascinated with specimens of the giant African snail that he decided to keep them as pets and return home with them. In accordance with this plan, "two live specimens, 3–3½ inches long" were secreted in the boy's suitcase and were neither declared nor discovered during port agricultural inspection. In the early phases of a leisurely auto tour across the country, the snails remained in satisfactory condition. However, the elevated temperatures of central Arizona, even in early May, seemed to provide a real threat to the snail specimens whose accumulated excreta only intensified the feeling that it was not proving practicable to continue further east with them. The decision to abandon the snails was reached at a time the boy and his father were visiting a wild animal farm near Mesa. As an apparent happy thought, it was agreed that the owner of this wild animal farm might be glad to have them with, surely, a tacit but obvious understanding.

Two weeks later, on 19 May 1958, it was decided by the owner of the farm to show these interesting animals on a television program scheduled for that evening. He realized suddenly that he did not know much more about them than the fact that they are a serious pest. In his search for additional data with which to fortify his talk, he recalled my article which appeared in the October 1949 READER'S DIGEST. In an effort to

get quickly the latest information, he called me long distance to explain his needs. He was warned soundly of the inherent danger and illegality, both state and federal, of having these animals alive in his possession. He was admonished not to show these animals on television and persuaded, instead, to contact the State Entomologist immediately so that he could be relieved of further responsibility. He was thoroughly impressed and promised to follow completely the advice given him. But as a safety measure, I telephoned both the Arizona State Entomologist, W. T. Mendenhall, and the Chief of the Federal Plant Quarantine Branch, E. P. Reagan.

State quarantine agents confiscated the giant snail specimens and destroyed them later that day. No eggs reportedly had been laid. The owner of the animal farm then wrote me a letter of confirmation, a part of which follows: "Had it not been for the magazine article that you wrote, I would probably still have these little creatures here in my office. I am certainly happy that the snails were given to me instead of some other person unfamiliar with animals. We can now feel reasonably safe in the fact that they are dead. Due to the circumstances surrounding their importation, I really don't think that there is anything to worry about." We can only hope that this latter statement is not overly optimistic. The persons involved are predestined to remain unknown and it is therefore not possible to determine for certain whether any presumed "dead" snails were earlier discarded in California or whether overlooked specimens remaining in the boy's possessions were subsequently discarded further east.

This case serves as still another abject lesson in how easily the giant African snail can become established in continental United States despite some of the most effective quarantine regulations in existence. Although some persons may be given to minimizing the element of danger by rationalizing that this species could not survive the arid conditions of central Arizona, research at the University of Arizona currently being conducted on alien terrestrial gastropod infestations present abundant evidence to the contrary. The rich, moist truck garden areas of the Salt River Valley in central Arizona appear particularly vulnerable to attack.

Insects of Hawaii, Volumes 6, 7 and 8 (A Review)

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Three outstanding contributions to the literature on the insect fauna of the Hawaiian Islands have been recently issued by the University of Hawaii Press. These three volumes, by E. C. Zimmerman, consist of highly important additions to the monumental series of publications under the general title INSECTS OF HAWAII.

Volume 6 covers the Ephemeroptera, Trichoptera and Neuroptera, and includes data concerning 58 species and subspecies in 12 genera. The orders Ephemeroptera (mayflies) and Trichoptera (caddisflies) are each represented in Hawaii by a single immigrant species. The remaining forms, which all fall within the order Neuroptera, consist of 27 species of Hemerobiidae, 24 Chrysopidae, 3 Myrmeleontidae and 2 immigrant Coniopterygidae. Of the Neuroptera, all but seven species are endemic.

Dr. Zimmerman's comments on the speciation amongst the Hemerobiidae and Chrysopidae are of exceptional interest. Some remarkable effects of insular evolution are displayed within the endemic Hemerobiidae and the speciation evidenced in the endemic Chrysopidae appears to outstrip that of any other Polynesian insect fauna. Excellent discussions are included on the developmental stages and the habits of members of these two families as exhibited in Hawaii. The illustrative portion of the book consisting of 104 figures, which includes photographs of the adults and their wings together with drawings of genitalia, adds greatly to the usefulness of the volume. Important bibliographies are given, and a 24 page supplement to Volumes 1 to 5 is included to bring up to date various needed corrections and additions. This book was issued August 15, 1957. It contains 209 pages and sells for $4.50.

Volume 7 deals with 168 kinds of the larger macrolepidoptera of the Islands known to the author at the close of 1956, which totals 158 moths and 10 butterflies. Of the moths, 59 are geometrids, 90 are noctuids and 9 are sphingids. Only 2 of the butterflies are native. Of the moths, 130 are endemic. The book discusses 46 genera. Twelve of the genera or subgenera are endemic. Approximately 60 percent of the names previously used for these insects necessarily have been changed as a result of Dr. Zimmerman's close study, and several new genera are proposed. There are 36 changes in the nomenclature of the Geometridae including the

erection of three new genera, and 77 changes in the Noctuidae. This volume embraces 542 pages, with 423 excellent figures and an extensive bibliography. It was issued on September 30, 1958 and is priced at $9.50.

Volume 8 treats the pyraloid moths of Hawaii known to Dr. Zimmerman through 1956. This book discusses 226 different moths of the superfamily Pyraloidea. There are 44 genera, comprising 190 endemic species and 36 of foreign origin. Seven of the genera are endemic and 90 percent of the 190 endemic species fall in only five genera. There are many new synonyms and new combinations, resulting in the changing of many names used in the past. Volume 8 covers 456 pages, with 347 figures prepared with the same care displayed in the preceeding volumes. There is an elaborate bibliography covering 30 pages. As in Volume 7, particular attention is given to distribution, host plants, parasites and predators; information which adds greatly to the permanent reference value of these publications. Much interesting data bearing on the known history of many of the species are also given. Apart from the inclusion of keys, necessary to any taxonomist in a study of Hawaiian moths, much can be found throughout the three volumes that makes fascinating and stimulating reading even to the amateur entomologist. Volume 8 was issued December 31, 1958 and sells for $8.00.

Special mention should be made of the illustrations that accompany the text throughout each book. The enlarged photographs of the adults and their genitalia are highly instructive, clear, and informative to anyone using the keys and other descriptive matter. There are also many finely prepared drawings illustrating head and wing characters.

The correct naming of an insect, especially if it is of economic importance, or should it become so in the future, establishes important information respecting its geographical distribution, its host range, and those of related forms, if any. This may prove of definite value should control through biological means be attempted. A striking example of this is disclosed in Dr. Zimmerman's discussion of the pyralid *Uresiphita polygonalis* (Dennis and Schiffermueller) on pages 116–118 of Volume 8. In Hawaii, this species has long been known as *Mecyna virescens* Butler, and was believed by all previous investigators of Hawaiian pyralids to be strictly a native of the Islands. His studies at the British Museum resulted in the discovery that this moth is an immigrant to Hawaii from Europe. It is destructive to an important native leguminous shrub, *Sophora chrysophylla,* (Sailsb.) Seem., in certain upland forest reserves in Hawaii. Locally known as *mamane,* this abundant plant is sometimes completely defoliated by caterpillars of the moth. Only recently the Associate Forester on the island of Hawaii has remarked on the periodic outbreaks of this pest. The correct naming of this moth now points clearly to that portion of the earth where natural enemies can be sought, and plans are already underway for such an investigation.

Dr. Zimmerman is to be congratulated on the completion of these three fine and useful volumes. Praise to the University of Hawaii Press is also due for the excellence in the quality of the printing and the clear reproduction of the illustrations.

The generous cooperation of the National Science Foundation made possible the completion and publication of these volumes.

Insects of Moku Manu Islet

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(Presented at the meeting of August 11, 1958)

Moku Manu Islet, which lies about one-half mile northeast of Mokapu Point, Oahu, is about one-fourth mile long by about one-eighth mile wide. No insects had been reported from the islet until J. L. Gressitt collected specimens there in 1954. This list, based upon his collection, contains 29 species in six orders, all of which are immigrants to Hawaii.

HEMIPTERA (HETEROPTERA)

Lygaeidae
Geocoris punctipes (Say)
Nysius kinbergi Usinger (see p. 92)
Anthocoridae
Orius persequens (White)

HEMIPTERA (HOMOPTERA)

Membracidae
Vanduzea segmentata (Fowler)

COLEOPTERA

Coccinellidae
Cryptolaemus montrouzieri Mulsant
Scymnus ocellatus Sharp
Scymnus roepkei Fluiter
Tenebrionidae
Gonocephalus adpressiforme Kaszab
Alphitobius piceus Olivier
Dermestidae
Eucnocerus anthrenoides Sharp
Dermestes cadaverinus Fabricius
Curculionidae
Hypurus bertrandi Perris; on *Portulaca oleracea* L.

DIPTERA

Sciaridae
Sciara sp.?
Chloropidae
Siphunculina signata Wollaston
Tachinidae
Salmacia longipulvilli (Tothill)

Sarcophagidae
Parasarcophaga argyrostoma (Robineau-Desvoidy)
Parasarcophaga misera (Walker)
Calliphoridae
Lucilia sericata Meigen
Hippoboscidae
Olfersia aenescens Thomson; from wedge-tailed shearwater

HYMENOPTERA

Bethylidae
Epyris extraneus Bridwell; Det. by C. M. Yoshimoto
Chalcidae
Brachymeria discreta Gahan
Brachymeria fonscolombei (Dufour)
Euchalcidia sp. nr. *philippinensis* Masi; Det. C. M. Yoshimoto
Braconidae
Apanteles sp.
Encyrtidae
genus near *Blepyrus* sp.
Formicidae
Prenolepis longicornis Latreille
Solenopsis geminata Fabricius
Apidae
Apis mellifera L.

LEPIDOPTERA

Pyralidae
Hymenia recurvalis (Fabricius)

The Identity of Nysius coenosulus Stål

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(Presented at the meeting of December 15, 1958)

In 1942 (B. P. Bishop Museum Bull. 173, p. 107) I said of *Nysius coenosulus* Stål, "I have not seen the type but have followed Kirkaldy's identification of this species." I felt justified in this because of Kirkaldy's statement (FAUNA HAWAIIENSIS, Vol. II, Pt. VI, p. 540, 1910), "Through the kindness of Dr. Aurivillius, I was able to see the type . . ." On a visit to the Naturhistoriska Riksmuseum in Stockholm in 1958 I looked at the type and saw that it did not agree with the interpretation quoted above. Subsequently Dr. Lars Brundin made it possible for me to study the type and compare it with my full collection of Hawaiian *Nysius* species in California.

As a result of this study the names of two of the commonest Hawaiian *Nysius* must be changed as follows:

1. **Nysius coenosulus** Stål, 1859
   Nysius nigriscutellatus Usinger, 1942; new synonym.

Stål (KONGL. SVENSKA FREG. EUGENIES RESA, ZOOLOGI. INSEKTER, p. 243, 1859) indicates that the type is a male, but the unique type specimen is a female bearing the labels, "Honolulu", "Kinb.", "coenosulus" and others more recently added.

2. **Nysius kinbergi,** new species
   Nysius coenosulus, Kirkaldy and Usinger, not Stål.

A full description and figure of the new species are given under *Nysius coenosulus* Stål (Usinger, B. P. BISHOP MUS. BULL. 173, pp. 106–107, pl. 8, fig. D and Plate 10). This is the common species on *Erigeron canadensis* L. on all the main islands of the Hawaii Archipelago. The species is dedicated to J. G. M. Kinberg, the physician and zoologist on the voyage of the Swedish Frigate Eugenie.

Holotype: male, Pauoa Flats, Oahu, July 21, 1935 (R. L. Usinger), (B. P. Bishop Museum). This specimen was formerly labeled as a plesiotype of *N. coenosulus.*

Revision of the Metrargini (Hemiptera, Lygaeidae)

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(Presented at the meeting of December 15, 1958)

The tribe Metrargini is unique, being confined to the Hawaiian Archipelago. It may be definitely classed as one of the archaic Hawaiian groups and exhibits typical insular radiation, breaking up into groups varying in degree from distinct genera to scarcely distinguishable variations. Zimmerman summarized the published information up to 1948 and gave original keys and figures. In the present paper descriptions are given of the new species which have accumulated in collections since the time of Kirkaldy and an attempt is made to work out distributional patterns and phylogeny.

Tribe Metrargini (Kirkaldy), 1902

Elongate oval or more nearly parallel; the head strongly elevated and closely punctate above and beneath; eyes strongly exserted, not touching the pronotum; ocelli distinct except in some brachypterous specimens, located near hind margin of head; antennae long and slender: rostrum reaching to or well beyond hind coxae. Pronotum variable in form, distinctly punctate except for callosities. Scutellum rather coarsely punctate and more or less strongly elevated at middle. Clavus and corium superficially punctate except for the usual two rows of deep punctures along claval suture. Corial veins distinct even in the brachypterous *villosa,* with Sc distinct and complete, reaching apical margin of corium, traversing the dilated costal area, R + M branching at apical fourth, Cu simple, unbranched in the corium. Membrane, in macropterous species, large, with three simple longitudinal veins in outer half, the usual branching vein arising near Cu, and a short inner vein that may be an anal vein crossing over the claval suture. Wings with hamus complete and decurrent, two apical veins well-developed. Ostiolar canals

short, straight, auriculate, surrounded by a dull evaporating area. Punctures of pleura extending on coxal flanges and even superficially onto postero-lateral margins of metapleura. Meso- and meta-sterna longitudinally grooved at middle. Second (first visible) ventral segment of abdomen largely concealed; third and fourth segments long, with trichobothria inserted near the middle; fifth and sixth segments, as in *Orsillini,* shorter, deeply emarginate for the reception of the ovipositor, with a pair of lateral trichobothria; seventh ventral segment with only a single trichobothria-bearing tubercle on either side. Abdominal spiracles all located dorsally on the connexivum and concealed by the expanded hemelytra. Ventral abdominal sutures all more or less complete and reaching lateral margins. Male genital capsule deeply foveate posteriorly.

Color fulvous to brown or dark fuscous, the head and sometimes other portions of the body black. Femora alternately ringed with fulvous and white and the joints between segments, at least of the antennae, pale. Hemelytra sometimes pale, spotted throughout.

Type genus: *Metrarga* Buchanan White

Basically very similar to the Orsillini but very different in appearance, being much broader and flatter; the hind margin of sixth tergite in the male subtruncate; the coxal flanges punctate; and vein Sc of the corium complete. *Metrarga* nymphs have a dorsal abdominal scent gland at the hind margin of the fourth and fifth tergites as in other Lygaeinae (Usinger, 1939).

Biology

Although the Metrargini have been known for nearly a century and over 200 specimens have been collected, knowledge of the biology is scanty. Kirkaldy (1907) described the nymphs and Perkins (1913) recorded his personal collecting notes and observations as follows:

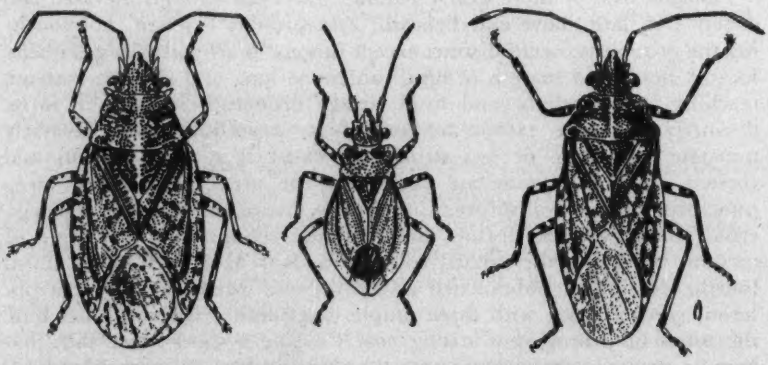


Figure 1. *Metrarga nuda* B. White, left. *Nesocryptias oahuensis,* n. sp., middle. *Nesoclimacias contracta* (Blackburn), right. (From Zimmerman, 1948).

Figure 2. Ieie vine (*Freycinetia arborea* Gaud.) growing on the crest of the Koolau mountains behind Honolulu. (From Williams, 1936).

"The winged species are often notably gregarious, a dozen to scores congregating together at the base of the leaves of a single plant of *Freycinetia*. The nymphs occur in the same situation, sometimes mixed with the adults. These winged species may also be found on the ground amongst dead leaves or fragments of fern fronds, while the flightless *M. villosa* seems to have taken entirely to a terrestrial life, and perhaps became flightless in accordance with these habits. It is remarkable that amongst large flocks of one of the winged species (e.g. *contracta*) one or two examples of another species (*nuda*) are sometimes found, so that the flocks are mixed. The odour of the species is disgusting, when a colony is disturbed, and taints the surrounding air. While the representatives of *M. nuda* that are found on Hawaii, Oahu, and Maui are very similar, it is noteworthy that the Molokai form, although of precisely similar habits, is more distinct in appearance superficially."

Records since Perkins' time tend to confirm his observations as to *Freycinetia* (ieie vine) being a host: *molokaiensis, swezeyi, contracta, lanaiensis,* and *oahuensis* having been taken in this way. Even *villosa,* which Perkins considers "to have taken entirely to a terrestrial life" was collected by the senior author (see under *oahuensis*) at the bases of leaves of the plant figured by Williams (Proc. Haw. Ent. Soc. 9:331, fig. 7, 1936) (fig. 2). However, additional host plant records have since been recorded as follows: *nuda—Metrosideros, Cibotium, Euphorbia; obscura* —Tree fern, *Tetraplasandra; villosa—Myoporum, Byronia; adamsoni—Osmanthus.*

Stridulation

In the typical genus *Metrarga* the costal margin of each hemelytron is minutely crenulate (fig. 3), the crenulations extending for a short distance as fine striations on the under surface of the wing. Immediately opposed to this on the inner apical portion of each hind femur is an area of small tubercles that could be interpreted as a scraper. Whether the file-like costal margin serves as a strigil and the hind femur as a plectrum is a matter of conjecture because sound production has not been reported for these bugs. However, similar structures have been observed in the Pyrrhocorid, *Arhaphe* (Lattin, 1958) and in other Lygaeids (Ashlock and Lattin, 1960). Thus this type of stridulatory mechanism (if that is what it is proved to be) is widely scattered in the Lygaeid bugs and must be assumed to have arisen independently in several groups.

The Phallus in the Metrargini

The phalli of the type species of all three genera display all of the basic characters of the orsilline phallus: lateral dorsal phallothecal processes absent; sclerotized area present distally on the conjunctiva; strong tendency for reduction of the ejaculatory reservoir; completely asymmetrical vesica with unpaired lobes, one of which is pigmented.

In a previous paper (Ashlock, 1957) it was suggested that the phallus of the Metrargini might differ from that of the Orsillini in the divided condition of the sclerotized region of the metrargine conjunctiva. At the time only *Nesoclimacias contracta* was available for study. Now that the types of all three genera have been investigated, this conclusion must

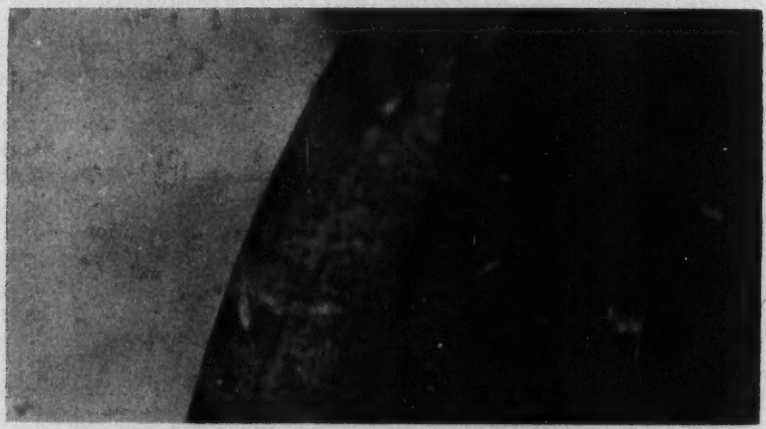


Figure 3. *Metrarga nuda* B. White. Costal margin of hemelytron in side view, showing finely crenulate strigil.

be discarded, since the character is not present in the type genus of the tribe.

The characters of the phalli (fig. 4) strengthen the phylogenetic relationships indicated by the key to genera below. In *Metrarga nuda* the phallotheca lacks sclerites; the conjunctiva has rounded lateral lobes just beyond the middle; the distal pigmented area extends completely around the ventral surface; the ejaculatory reservoir retains rudiments of the "wings"; and the vesica has three lobes, including the pigmented one, that extend from the main axis of the phallus.

In *Nesoclimacias contracta* and *Nesocryptias villosa,* the phallothecae possess sclerites on their ventral surfaces; the conjunctivae are without medial lateral lobes; the distal pigmented areas are separated into two lateral ventral lobes; the ejaculatory reservoirs lack "wings" and are reduced to the point of barely indicating the juncture of the conjunctival seminal duct to the vesical seminal duct; and the vesicae have two basal lobes, one pigmented, followed by elongate tubular twisted areas.

Differences in the appearance of the stapes at the base of all these phalli should not be taken too seriously, since they must be observed through the membranes and muscles connecting the phallus with the genital capsule. The phallus of the *Metrarga* illustrated is perhaps underinflated, and the distal area of the vesica of the *Nesoclimacias* phallus appears to be over-inflated. Several specimens of *Nesoclimacias* burst under osmotic pressure before this example was obtained.

No new character emerges from the above to separate the Metrargini from the Orsillini. The lateral unpigmented lobes on the conjunctiva of the *Metrarga* phallus have not been reported before in the orsillines, but differently placed unpigmented lobes have recently been found on the conjunctiva of the phallus of *Oceanides nimbatus* (Kirk.).

Taxonomic Position of the Orsillines

In a recent revision of the cymine tribe Ninini, Scudder (1957) makes the following statement. "The tribe Ischnorhynchini is transferred from Cyminae to Orsillinae, the latter being regarded distinct from Lygaeinae." He gives no evidence to support these changes.

A number of workers have indicated characters which would support Scudder's view that the Orsillini are not related to the Lygaeini. Slater and Hurlbutt (1957, p. 69) found that the metathoracic wings of members of the Lygaeini have a subcostal vein. This is unique within the family Lygaeidae. Ashlock (1957, p. 419) states: "From the evidence obtained by study of the male genitalia, it would appear that the Lygaeini and Orsillini are not at all related." Characters of the pullus of the Lygaeini, as contrasted to those of the Orsillini are:

Lateral phallothecal processes present; conjunctiva without sclerites; ejaculatory reservoir apparently always complete; vesica basally symmetrical with lobes paired, and distally coiled, exceptionally wrinkled

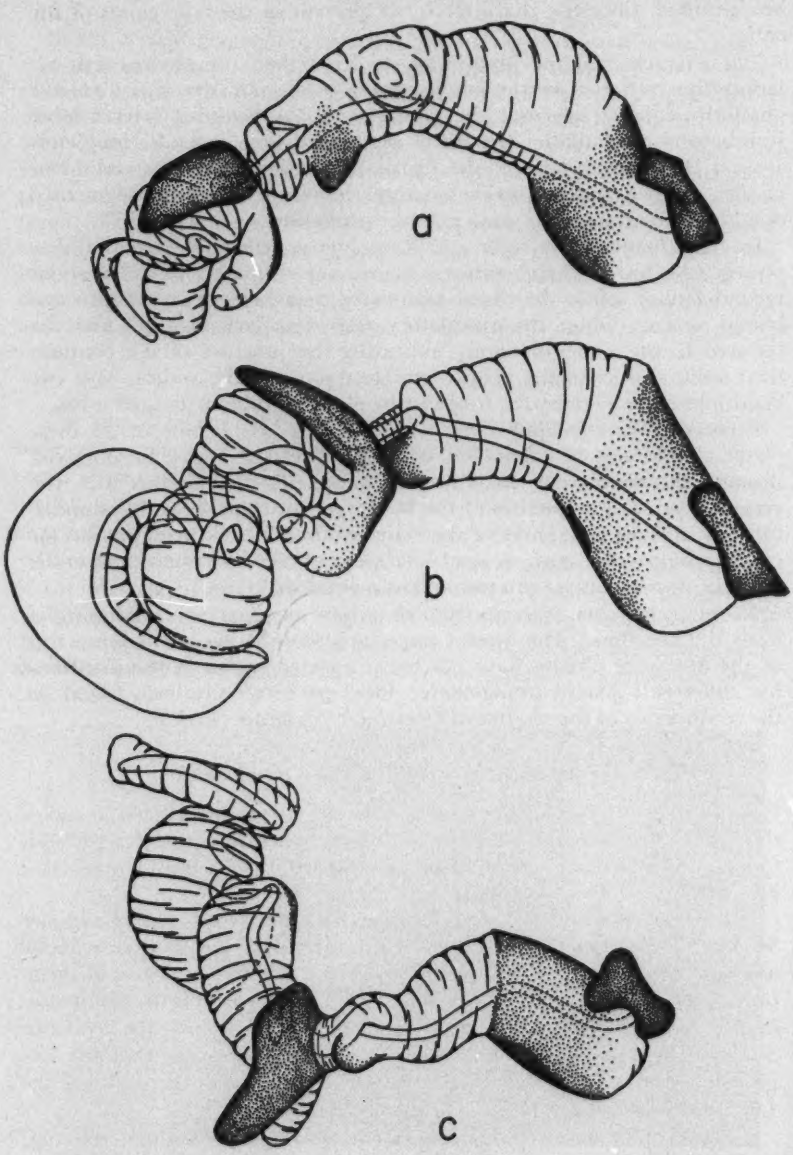


Figure 4. Phalli of: a) *Metrarga nuda* B. White, b) *Nesocryptias villosa* B. White (Oahu, Blackburn), c) *Nesoclimacias contracta* (Blackburn).

and bearing a sclerite on inner surface of coil, the two areas separated by a sclerite, frequently ring shaped; gonoporal process bearing a tiny or elongate apical process beyond the secondary gonopore.

Southwood (1956, pp. 192-4) described the eggs of the Lygaeini as having eleven to fourteen micropylar processes that are comparatively large and clavate, while the eggs of the Orsillini have only three to six micropylar processes that are papilliform or clavate, but very small. In discussing the Orsillini he states: ". . . this tribe deserved higher status than commonly accepted," and "Leston (*personal communication*) is also of the opinion that the Lygaeini and Orsillini are not consubfamilial and points out that the cytology (as elucidated by Pfaler-Collander, 1941) and other data support this view."

To the traditional external characters[1] the following may be added:

Orsillini. Ovipositor long and ventrally displacing segments seven to five or four anteriorly; male genital capsule with a deep ventral fovea; ostiolar peritreme elongate, extending at least one-third (usually halfway) up side of metathorax; evaporative area round peritreme extensive.

Lygaeini. Ovipositor short, ventrally displacing segment seven slightly or not at all; male genital capsule with two shallow or no ventral foveae; ostiolar peritreme shorter, not extending more than one-third up side of metathorax, or ostiole without a peritreme; evaporative area quite reduced or commonly absent.

Scudder's contention that the Ischnorhynchini are not related to the other two tribes of the Cyminae (Cymini and Ninini) also can be supported easily from published data. Slater and Hurlbutt (1957, p. 69) feel that the division of this subfamily into the Ischnorhynchini and Cymini is untenable and state: ". . . the Ischnorhynchini wing is very generalized, whereas in the Cymini and in *Ninus* and its allies, the hind wing shows the most specialized condition in the entire family." Ashlock (1957, p. 416) states: "The appearance of the phallic structures indicates that the two tribes differ (in this respect, at least) more from one another than do the lygaeines from the orsillines." Southwood (1956, p. 194) states: "The egg of *Kleidocerys* [Ischnorhynchini] shows that this genus cannot be included in the same subfamily as *Cymus*. This is supported by the general morphology (Gulde, 1936) and the cytology (Pfaler-Collander, 1941) . . ."

Usinger (1942, p. 16) states that: "*Metrarga* is structurally every similar to the Orsillini but is very different in appearance, being much broader and flatter, the antenniferous tubercles sharply produced as stout spines,

[1] These are: Lygaeini; apical margin of corium straight, antenniferous tubercles obtuse or subobtuse: Orsillini; apical margin of corium deeply sinuate, antennal tubercles acute or subacute.

the posterior margin of sixth tergite in the male subtruncate, the coxal flanges punctate and corial vein Sc distinct throughout its length and evidently complete, joining apical margin of corium near apex. As pointed out by H. G. Barber (personal correspondence) this group certainly deserves no more than tribal rank within the Lygaeinae."

The authors believe that the orsillines really should be given subfamily rank, and that the Hawaiian Metrargini, and the monobasic Robinsonocorini from Juan Fernandez Island (Kormilev, 1952), as well as the Orsillini proper should be included in the subfamily. But we can find no reason for Scudder's placement of the Ischnorhynchini in the Orsillinae.

The only similarities known to us are the dorsally situated spiracles and the long ovipositor, both of which characters occur in other subfamilies in the Lygaeidae. Nearly all other characters are quite different, particularly the eggs, the phalli, the punctation of the hemelytra, the posterior margin of the corium, the veins of the clavus and corium, apparent or not, etc. Thus, we are unable to agree with Scudder's conclusions and prefer to recognize the following subfamilies: 1) the Lygaeinae, 2) the Orsillinae (including Metrargini, Orsillini, and Robinsonocorini), 3) the Cyminae (including Cymini and Ninini,) and 4) the Ischnorhynchinae.

Key to the Genera of Metrargini

1. Pronotum toothed or angulately produced antero-laterally. Costal margins dilated from the bases of hemelytra, with strigil consisting of fine striations extending a short distance under expanded margin ..... **Metrarga**
   Pronotum rounded or roundly lobed antero-laterally. Costal margins dilated beyond basal fifth, without a strigil 2

2. Membrane complete, as wide as corium ..... **Nesoclimacias**
   Membrane greatly reduced, about half as wide as corium ..... **Nesocryptias**

Genus **Metrarga** Buchanan White

Metrarga B. White, 1878, Ann. Mag. Nat. Hist. (5) 1:370.
Metrarga, Kirkaldy, 1908, Proc. Haw. Ent. Soc. 1:189 (as subgenus).
Metrarga, Kirkaldy, 1910, Fauna Haw. 2:535 (as subgenus).
Metrarga, Zimmerman, 1948, Ins. Hawaii 3:107 (as genus).

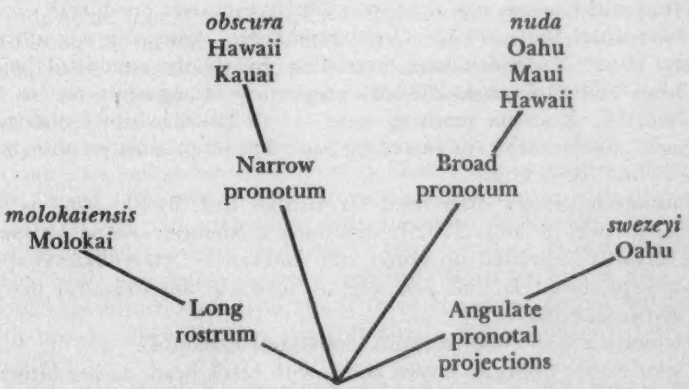
Rather broad and subflattened above, and only moderately convex beneath. Antenniferous tubercles distinctly, often strongly produced.

Rostrum not surpassing middle of abdomen, the first segment not or scarcely exceeding base of head. Pronotum relatively broad, distinctly narrowed anteriorly, the sides sinuate, antero-lateral angles either acutely produced or extending as small angular lobes behind eyes. Scutellum broader at base than long, the commissure of clavus about 2/3 as long as scutellum. Hemelytra broadly expanded, the costal areas of coria dilated from the base, the margins with fine cross-striations forming a strigil. Membrane large but not greatly extended beyond level of apices of coria, broader than greatest width of corium, extending not or scarcely more than half as far beyond level of apices of coria as length in front of this. Hind wings complete, fully developed. Body inconspicuously pubescent above except occasionally on head and front lobe of pronotum. Parameres relatively long, roundly elbowed and attenuated apically. Size 6-9 mm.

Type of Genus: *Metrarga nuda* Buchanan White.

Typical *Metrarga* has been reported from all the islands except Lanai, where it will doubtless be discovered with further collecting.

The known distribution of the species of *Metrarga* is not consistent with the present geographic arrangement of the islands. Thus *obscura* occurs at opposite ends of the main island chain whereas the most distinctive species of all, *molokaiensis,* occurs on the middle island. Possibly further collecting of these rare insects will fill in gaps and explain some of the anomalies in distribution. That the species concept is sound is attested by the occurrence of both *nuda* and *obscura* in the same series collected by Perkins at Kona on the island of Hawaii. Thus the two closest species that run to the same couplet in the key appear to be sympatric. *Nuda* and *swezeyi* may also occur together on Oahu since they have both been reported from the Waianae Mountains.



Relationships of the species of *Metrarga*

KEY TO THE SPECIES OF METRARGA

1. Rostrum long, reaching base of fourth (third visible) abdominal segment. Pronotum shorter than head. Femora all brown ..... **molokaiensis**

   Rostrum short, not surpassing hind coxae. Pronotum longer than head. Color light brownish ferrugineous or pale ochraceous 2

2. Antero-lateral angles of pronotum produced as angulate, anteriorly rounded lobes. Antennae short, much less than half again as long as head and pronotum together (219:180). Color pale, ochraceous, with light brown marks and punctures. Oahu ..... **swezeyi**

   Antero-lateral angles of pronotum produced as slender, acute spines. Antennae longer, over half again as long as combined length of head and pronotum (258:160). Color fulvous to ferrugineous 3

3. Width across pronotal spines greater than width across eyes. Anterior lobe of pronotum broadly dilated (Fig. 5a). Oahu, Maui, Hawaii ..... **nuda**

   Width across pronotal spines equal to or less than width across eyes. Front lobe of pronotum less strongly dilated (Fig. 5d). Hawaii, Kauai ..... **obscura**

Metrarga molokaiensis, new species

Body form elongate-oval, the surface glabrous with only very short, sparse, inconspicuous hairs above on clavus and corium.

Head wider across eyes than long, 79:70; eyes over one-fourth as wide as interocular space, 14:52. Ocelli prominent. Antenniferous tubercles short, blunt. Antennae long, exceeding greatly the combined lengths of head and pronotum, 232:132; proportion of segments one to four 40:70:67:55. Rostrum reaching onto fourth (third visible) abdominal segment, the first segment exceeding base of head; proportion of segments one to four 65:65:63:50.

Pronotum shorter than head on median line, 61:70, twice as wide across humeri as long, 120:61; disk only moderately raised at middle and broadly depressed on either side anteriorly. Antero-lateral spines acutely produced laterad and slightly forward; antero-lateral margins evenly sinuate (fig. 5c).

Hemelytra with costal margins moderately expanded.

Color rather uniform, brown above with black head, darker brown on anterior lobe of pronotum and ill-defined pale marks on costal margins. In clearly marked specimens there are ivory spots at middle of anterior

and posterior margins of pronotum, at apex of scutellum and at extreme base of vein R + M on corium. Antennae pale brown, the first segment darker and joints between segments paler. Under surface brown with pale on bucculae and ostiolar peritreme. Rostrum pale brown. Legs with trochanters pale, femora entirely brown. Tibiae brown with ill-defined pale areas subbasally and subapically. Tarsi pale basally.

Size: male, length 6.75 mm., width (pronotum) 2 mm.; female, length 8.2 mm., width (pronotum) 2.2 mm.

Holotype male, allotype female, and five male and three female paratypes: Molokai, 2500 ft. Febr. 1902, on *Freycinetia* (R. C. L. Perkins), (B. P. Bishop Museum). In addition there are two males and a female from the Perkins collection labelled "Molokai" and one female, Molokai, H. Isls. Aug. 26, 1909, (D. T. Fullaway).

This species is closest to *obscura* but differs strikingly in body form, color, length of rostrum, etc.

Metrarga swezeyi, new species

Body elongate-oval. Surface shining, appearing naked but with very fine, appressed hairs at sides and base of head, in front of pronotal callosities and at basal angles of scutellum. Also with very short, inconspicuous, sparse hairs on coria.

Head a little wider across eyes than long, 29:25; ratio of width of interocular space to width of an eye 58:14. Vertex finely punctured. Ocelli prominent. Antenniferous tubercles short but distinct, about as long as wide at base, blunt at apices. Antennae longer than head and pronotum together, 202:170; proportion of segments one to four 31:66:60:45. Rostrum reaching hind coxae, the first segment not attaining base of head; proportion of segments one to four 50:55:55:42.

Pronotum at middle one-third longer than head (32:25); less than twice as wide across humeri as long, 56:32; disk strongly elevated with a shallow depression at middle and broadly depressed antero-laterally; antero-lateral angles prominent, flattened, produced laterad and a little forward behind eyes; antero-lateral margins strongly sinuate behind this fig. 5b) and abruptly so at middle.

Hemelytra with costal margins only moderately expanded.

Color pale yellow brown above with head black, pronotum ochraceous with brown callosities and punctures, scutellum brown with pale apex, hemelytra pale and subhyaline with numerous brown spots on corium and ill-defined spots on membrane. Under surface brown. Antennae brown with pale joints between segments. Rostrum brown with black apex. Legs brown with pale apical third of femora ringed subapically with brown; tibiae broadly pale subbasally and subapically; tarsi pale basally.

Size: male, length 8 mm., width (pronotum) 2.75 mm.; female, length 8.5 mm., width (pronotum) 3 mm.

Holotype: male, Waianae Mts., Oahu, July, 1955, (E. J. Ford, Jr.), (B. P. Bishop Museum). Allotype: female, Palikea, Oahu, June 30, 1935, *Freycinetia* (F. X. Williams), (B. P. Bishop Museum). Paratypes: one female, Pukaloa Valley, Waianae Mts. Oahu, March 22, 1936 (R. L. Usinger); one male, Mt. Kaala, Oahu, July 21, 1929 (F. X. Williams); one female, Nanakuli, Oahu, Febr. 14, 1938 (Geo. Mau).

Swezeyi is very close to typical *nuda* but has a dictinctive facies and may be separated by the broader differently shaped antero-lateral spines of pronotum, the shorter antennae, and the pale color. Thus far it has been taken only in the Waianae mountains, whereas *nuda* occurs both in the Waianae and in the Koolau Mountains.

Metrarga nuda Buchanan White

Metrarga nuda B. White, 1878, ANN. MAG. NAT. HIST. (5) 1:371.

Metrarga nuda var. *mauiensis* Kirkaldy, 1908, PROC. HAW. ENT. SOC. 1:188.

Body relatively broadly oval. Surface of head and pronotum around callosities with a very fine, inconspicuous pubescence of appressed hairs. Clavus and corium with very short, sparse pubescence as seen at a magnification of 27X.

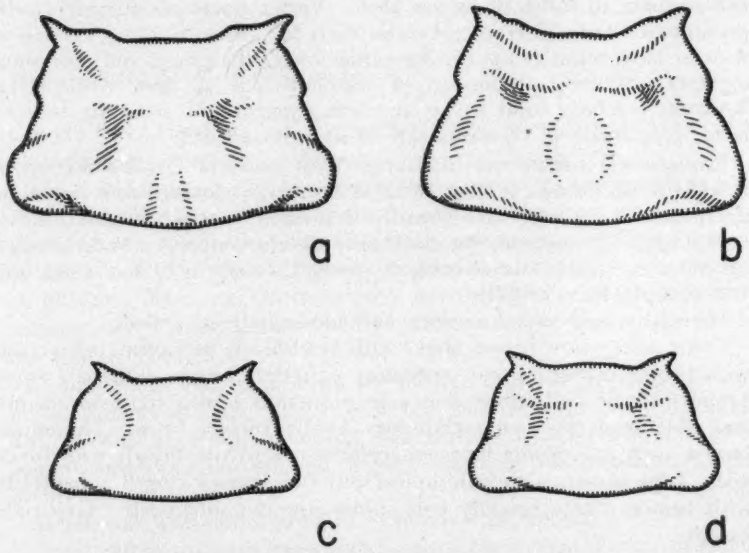


Figure 5. Pronota of: a) *Metrarga nuda* B. White, b) *Metrarga swezeyi*, n. sp., c) *Metrarga molokaiensis*, n. sp., d) *Metrarga obscura* Blackburn.

Head distinctly wider across eyes than long on median line, 98:74; eyes over one-fourth as wide as interocular space, 17:64. Vertex so densely punctured that the punctures exceed in area the raised portions between punctures. Antenniferous tubercles relatively long, twice as long as wide at base, subacute. Ocelli prominent. Antennae long, over half again as long as combined lengths of head and pronotum (258:160); the proportion of segments one to four 45:75:70:68. Rostrum reaching to hind coxae, the first segment attaining base of head; proportion of segments one to four 60:56: 18:43.

Pronotum distinctly longer than head on median line, 89:74; less than twice as wide across humeri as long, 157:89. Disk raised and then subflattened at middle of hind lobe, broadly depressed on either side anteriorly. Antero-lateral spines prominent, subacute; antero-lateral margins abruptly bent at middle (fig. 5a).

Hemelytra with costal margins strongly dilated from the base.

Color pale brown above with black head, dark brown callosities, clavus and corium pale and subhyaline with numerous brown spots. Membrane hyaline and brown-spotted. Tips of antenniferous spines and pronotal spines, midline and humeri on pronotum, apex of scutellum and vein R + M at base ivory. Antennae brown with pale joints. Under surface brown with pale bucculae, acetabular margins, ostiolar peritreme and lamellate hind margins of metapleura. Rostrum dark brown at apex. Legs with pale trochanters. Femora pale with a median and a subapical brown ring. Tibiae brown at base, middle and apex. Tarsi brown apically.

Size: male, length 7.75 mm., width (pronotum) 2.75 mm.; female, length 9.3 mm., width (pronotum) 3.2 mm.

The type, a male, Honolulu No. 20 (No. 24 under the card) is in the British Museum (Nat. Hist.).

Redescribed from the male plesiotype figured in Zimmerman (1948, fig. 39). The latter specimen is from Haleauau, Oahu, Sept. 14, 1930, Koa (O. H. Swezey). A specimen is before us from the Blackburn collection labelled "*Metrarga nuda* 24". It is from "Oahu". Nine specimens are at hand from the Perkins collection, from Honolulu Mtns. 1800 ft. Oct. 1903 and other localities near Honolulu. Three of these are labelled "Fauna Hawaiiensis collection" and a fourth, collected by Perkins in 1893, is from "Kaala Mts.", Oahu. Additional material includes over two dozen specimens, mostly from Tantalus in the Koolau Range and Haleauau in the Waianae Mtns. The sizes given above span approximately the range seen in our series.

Kirkaldy (1908) described the variety *mauiensis*, but four specimens from Haleakala, 4000 ft. (R. C. L. Perkins); Mahena, Oct. 13, 1926 (O. H. Swezey); Iao Valley, Sept. 24, 1896, (O. Koebele Coll.) seem to fall well within the range of variation of typical Oahu specimens. Two specimens in the British Museum from Iao Valley, 1894 (Perkins) are a little paler and less marked but are not worthy of a separate name.

Metrarga obscura Blackburn

Metrarga obscura Blackburn, 1888, Proc. Linn. Soc. N. S. Wales 3:347.

Body form relatively broadly elongate-oval. Surface with fine, appressed hairs, visible at 27X magnification on head, sides of pronotum, scutellum and hemelytra.

Head wider across eyes than long, 82:65; eyes over one-fourth as wide as interocular space, 15:54. Ocelli prominent. Antenniferous tubercles about twice as long as wide at base, subacute. Antennae long, over half again as long as combined lengths of head and pronotum, 230:132; proportion of segments one to four 43:66:63:58. Rostrum reaching hind coxae, the first segment not attaining base of head; proportion of segments one to four 55:50:44:42 (measured on female from Kilauea, R. C. L. Perkins).

Pronotum a little longer than head on median line, 68:65; less than twice as wide across humeri as long, 126:68; disk only moderately elevated and a little depressed at middle of hind lobe. Antero-lateral spines short, the distance across apices equal to or less than width of head across eyes. Antero-lateral margins rather evenly sinuate. (fig. 5d).

Hemelytra with costal margins moderately to strongly expanded.

Color brown above with black head and with pale spots at apices of antenniferous tubercles and pronotal spines, along middle of pronotum and on humeri, at apex of scutellum, and with pale spots on hemelytra as in *nuda*. Under surface and appendages brown, the femora mostly brown with an ill-defined pale ring beyond middle and another subapically.

Size: male, length 6.5 mm., width (pronotum) 2.2 mm.; female, length 7.75 mm., width (pronotum) 2.5 mm.

Redescribed from a male in the Perkins collection, Olaa, Hawaii, 1500 feet, July 1903. Also before us are a male and female, presumably from the type series in the Blackburn collection, marked with the symbol for Hawaii and labelled "*Metrarga obscura* 121" beneath the cards to which the specimens are affixed. Ten additional specimens are before us, all from Hawaii: Kilauea, Mauna Kea, Kona, collected by Perkins and Swezey.

Obscura is very close to *nuda* but has shorter pronotal spines and is consistently smaller and darker.

A single male from Kokee, Kauai, August 20, 1925 (O. H. Swezey) will key out here but has an entirely different type of pubescence. Its placement must be regarded as tentative at this time.

Genus **Nesoclimacias** Kirkaldy

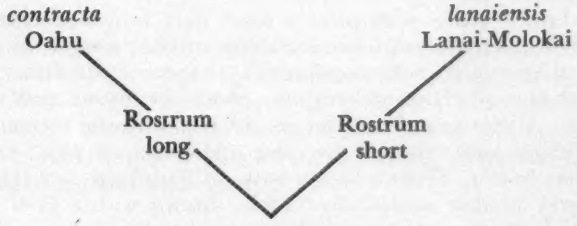
Nesoclimacias Kirkaldy, 1908, Proc. Haw. Ent. Soc. 1:189 (as subgenus).

Nesoclimacias Kirkaldy, 1910, FAUNA HAW. 2:534 (as subgenus).
Nesoclimacias, Zimmerman, 1948, INS. HAWAII 3:109 (as genus).

Long and relatively narrow, the sides thus appearing subparallel, subflattened above, and moderately convex below. Antenniferous tubercles very briefly produced as rounded lobes, scarcely exceeding bases of antennae. Rostrum exceedingly long, reaching to or beyond third visible abdominal segment. Pronotum narrowed anteriorly, the sides sinuate and rounded antero-laterally to front margin. Scutellum broader than long; commissure of clavus about ⅔ as long as scutellum. Hemelytra complete, subparallel along basal fifth, beyond which the costal margins are moderately, arcuately dilated. Costal margins not minutely crenulate (strigil). Membrane complete, extending over half again as far beyond apices of coria as its length before this, broader than width of corium. Hind wings complete, well-developed. Pubescence inconspicuous above except at base of scutellum, surrounding callosities, and on head. Parameres relatively long, roundly elbowed at middle and attenuated apically. Size 7 to 9 mm.

Type of genus: *Metrarga contracta* Blackburn.

Nesoclimacias is reported only from the adjacent islands of Oahu, Molokai, and Lanai.



Relationships of the species of *Nesoclimacias*

KEY TO THE SPECIES OF NESOCLIMACIAS

1. Rostrum reaching nearly or quite to fifth visible abdominal segment, the first segment nearly attaining level of front coxae. Oahu ..... contracta

   Rostrum much shorter, not surpassing third visible abdominal segment, the first segment reaching only to anterior fourth of prosternum. Lanai, Molokai ..... lanaiensis

Nesoclimacias contracta (Blackburn)

Metrarga contracta Blackburn, 1888, PROC. LINN. SOC. N. S. WALES 3:347.

Metrarga (Nesoclimacias) contracta var. *picea* Kirkaldy, 1908, PROC. HAW. ENT. SOC. 1:188.

Body form elongate with sides, at bases of hemelytra, subparallel. Surface appearing glabrous but with fine hairs on sides of head and pronotum, around callosities, and very short and sparse hair on scutellum and hemelytra.

Head wider across eyes than long, 90:80; eyes over one-fourth as wide as interocular space, 17:55. Ocelli prominent. Antenniferous tubercles obsolescent, shorter than width at base and rounded at apices. Antennae very long, over half again as long as combined length of head and pronotum, 277:158; proportion of segments one to four 48:82:80:67. Rostrum long, reaching to hind margin of fifth abdominal segment, the first segment almost attaining front coxae; proportion of segments one to four 48:82:80:67.

Pronotum subequal to head on median line, 77:78; nearly twice as wide across humeri as long, 160:77; disk strongly elevated behind, depressed around callosities; antero-lateral angles without spines or tubercles, the antero-lateral margins lobulately rounded (fig. 6a).

Hemelytra subparallel at bases of costal margins, extending about half the length of scutellum.

Color brown above, with piceous head, dark brown callosities, white at apices of antenniferous tubercles, along anterior margin, at four spots on disk of pronotum behind callosities, at apex of scutellum, and pale spots over most of clavus and corium. Membrane brown with very faint pale spots. Antennae and rostrum pale brown, the latter with apex black. Under surface with edges of bucculae and acetabula pale. Coxae and trochanters brown. Femora brown with an ill-defined pale ring beyond middle and another subapically. Tibiae brown with a faint ring subbasally and another subapically. Tarsi pale basally.

Size: male, length 8 mm., width (pronotum) 2.5 mm.; female, length 9.8 mm., width (pronotum) 3.1 mm.

Redescribed from a male, Tantalus, Oahu, September 1906 (R. C. L. Perkins). This is the specimen figured in Zimmerman (1948, fig. 39). A large female from the same series was taken to show the extremes in measurement above. A long series is at hand, mostly from Tantalus, collected by Perkins, Swezey, and J. W. Smith. Two small but otherwise typical specimens were collected by F. X. Williams, at Haleauau, in the Waianae Mts., Dec. 1, 1929. The type locality is stated by Zimmerman (1948) to be Konahuanui. A specimen from this locality is in the J. A. Kusche collection at the California Academy of Sciences. Kirkaldy's (1908) variety *picea* falls within the range of this dark species and was described from the Koolau Mtns. where *contracta* occurs. It is not rec-

ognized here.

In the female the rostrum appears to reach further (7th segment) because of the modifications of the venter to accommodate the ovipositor. The first rostral segment actually reaches the front coxae in some specimens.

Nesoclimacias lanaiensis Kirkaldy

Metrarga (Nesoclimacias) lanaiensis Kirkaldy, 1908, Proc. Haw. Ent. Soc. 1:189.

Elongate oval, the surface glabrous and minutely pubescent, at least on head, pronotum and scutellum.

Head broader across eyes than long, 35:30, the interocular space about three times as wide as an eye 21:7. Antennae missing on the type. Rostrum surpassing hind coxae but extending only onto third (second visible) ventral segment, (the specimen is partially broken between pro- and mesothorax so this character is difficult to make more precise). The first rostral segment extends about to anterior fourth of prosternum but definitely not to front coxae; proportion of segments one to four 28:25:20:17.

Pronotum as long as head on median line, 30:30; nearly twice as wide across humeri as long, 58:30; the front lobe with sides rounded and a little dilated, four-fifths as wide as posterior width across humeri, 46:58. Disk with a distinct raised median longitudinal carina and with humeri prominently raised.

Hemelytra relatively short with costal margins arcuate, the ratio of total length of hemelytron (to tip of membrane): greatest width (at level of apex of corium) 120:44; the length of corium (on same scale) 100, the length of clavus 56. (Comparable figures for typical *contracta* are 130 long by 35 greatest width, the hemelytra thus being longer and narrower and the costal margin less curved).

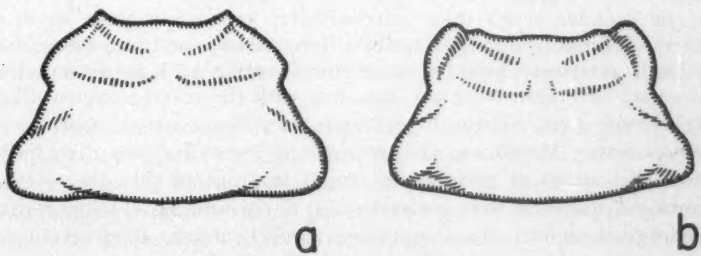


Figure 6. Pronota of: a) *Nesoclimacias contracta* (Blackburn), b) *Nesoclimacias lanaiensis* Kirkaldy (Molokai specimen).

Color brown with head darker, black, legs brown with apices of coxae, trochanters, and bases of tarsi paler, the femora each with a pale ring subapically and an ill-defined pale area at apex. Corium and membrane with numerous pale spots quite unlike typical *contracta*.

Size: length 7.7 mm., width (pronotum) 2.4 mm.

The holotype (British Museum) is a male, Lanai, 2000 ft., Perkins, XII, 1893. This is the specimen referred to by Kirkaldy (1908) in his original description. The second specimen labelled Halepaakai, Perkins, XII, 1894, is only a single hemelytron. The type has both hemelytra removed but one is carded below on the same pin. Kirkaldy (and Perkins, fide Kirkaldy) were in error in assuming that the Fauna Hawaiiensis figure 43 is of this. The figure looks like a typical Oahu *contracta* and, indeed, there are two specimens carded together "Konahuanui Ridge, XI, 1900" that bear a red label (as does *lanaiensis!*) saying "figured specimen".

A male from Kainalu, Molokai, 2000–3000 ft., *Freycinetia* (E. H. Bryan, Jr.) seems to belong here. The pronotum is shown in fig. 6b. The ratio of antennal length to combined lengths of head and pronotum is 265:141. The proportions of segments one to four are 30:75:75:65.

Genus Nesocryptias Kirkaldy

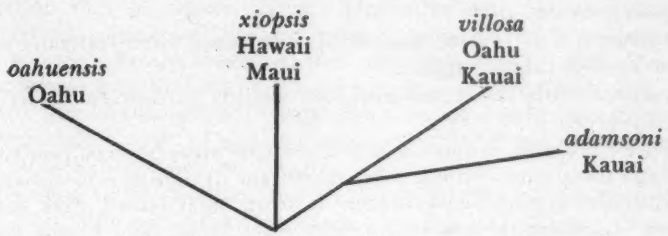
Nesocryptias Kirkaldy, 1908, Proc. Haw. Ent. Soc. 1:189 (as subgenus).

Nesocryptias Kirkaldy, 1910, Fauna Haw. 2:534 (as subgenus).

Nesocryptias, Zimmerman, 1948, Ins. Hawaii 3:110 (as genus).

Elongate oval in form, subflattened above and rather strongly convex beneath. Antenniferous tubercles short but distinct, briefly produced beyond bases of antennae, feebly divergent, rounded at apices. Rostrum reaching third or fourth visible abdominal segment, the first segment surpassing base of head. Pronotum variously developed, transverse, the lateral margins slightly to strongly sinuate, the antero-lateral angles rounded or strongly, roundly ampliate. In the latter case the pronotum may be broader across these antero-lateral expansions than across the humeri. Scutellum nearly or quite as long as wide at base. Commissure of clavus relatively long, in some cases nearly as long as scutellum. Hemelytra divergent from the base but with the costal margins dilated only behind basal eighth. Costal margins without strigil. Corial veins inconspicuous. Membrane greatly reduced, extending less than half as far beyond apices of coria as its length in front of this, the width of membrane much less than greatest width of corium. Hind wings reduced to brief pads, shorter than scutellum or entirely absent. Parameres broadly rounded and sinuate basally, attenuated and moderately curved apically, not very long and not roundly elbowed. Size relatively small, 4½ to 6 mm.

Type of genus: *Metrarga villosa* Buchanan White.
Recorded from Kauai, Oahu, Maui, and Hawaii.



Relationships of the species of *Nesocryptias*

KEY TO THE SPECIES OF NESOCRYPTIAS

1. Width across anterior lobe of prothorax equal to or greater than across posterior lobe. Oahu ..... **oahuensis**
   Width across anterior lobe of prothorax less than diameter across posterior lobe 2

2. Constriction of prothorax at about the middle. Hawaii, Maui .. **xiopsis**
   Constriction at the posterior third of prothorax 3

3. Lateral margins of anterior lobe of pronotum strongly arcuate, corium with thick appressed pile. Oahu, Kauai ..... **villosa**
   Lateral margins of anterior lobe of pronotum nearly straight, corium with a scattering of appressed hairs. Kauai ..... **adamsoni**

Nesocryptias oahuensis, new species

Body elongate oval, surface dull. Head and lateral margins of prothorax with dense hairs, remaining parts with sparse short appressed hairs.

Head wider across eyes than long, 72:62, ratio of interocular space to width of an eye 46:12. Vertex obscurely punctate. Ocelli absent. Antenniferous tubercles short, about as long as broad at base, apex blunt. Antennae longer than head and pronotum together, 177:116, proportions of segments 38:43:53:43. Rostrum attaining middle of fourth (third visible) abdominal segment, first segment surpassing base of head, proportions of segments one to four 51:52:40:33.

Pronotum at middle shorter than head, 56:62, anterior lobe strongly

rounded, wider than width across posterior lobe, 90:86, construction between lobes nearly at posterior two-thirds. Disk depressed, lateral margins somewhat raised, callosities slightly raised, median carina prominent anteriorly only (fig. 7a).

Scutellum not as wide as long, 42:51, disk raised antero-laterally with carinae to each lateral angle.

Hemelytra with costal margins very slightly constricted before expanded portion.

Color dark brown, pronotum with a few pale areas between punctures, hemelytra opaque, of uniform color, membrane hyaline brown. Antennae brown, fourth segment dark brown. Rostrum light brown, dark brown at apex. Legs light yellow brown, with three broad light brown anulations on each femur and tibia, tarsi brown.

Size: male, length 4.8 mm., width 1.5 mm.; female, length, 5.4 :nm., width (pronotum) 1.7mm.

Holotype: Mt. Olympus, Oahu, on *Freycinetia* (ieie vine) Oct. 6, 1935, (R. L. Usinger), (B. P. Bishop Museum). Allotype: same data as holotype, (B. P. Bishop Museum). Paratypes: two females, same data as holotype, (U. S. National Museum); one male and two females, Mt. Olympus, Oahu, on *Bryonia,* Oct. 6, 1935 (R. L. Usinger), (one in B. P. Bishop Museum, two in collection of R. L. Usinger); one female, Mt. Olympus, Oahu, 2300 ft., Aug. 23, 1936 (F. X. Williams), Expt. Sta., H.S.P.A.); one female, Mt. Tantalus, Oahu, June, 1952 (M. Adachi), (Univ. of Hawaii); one specimen, Lanihuli side of Nuuanu about 2000 ft. in dead leaves, Jan., 1902 (R. C. L. Perkins), (B. P. Bishop Museum); one specimen Waiolani, Oahu, (Brit. Mus. Nat. Hist.).

Nesocryptias xiopsis, new species

Body elongate oval, surface shining with sparse vestige of fine appressed hairs.

Head wider across eyes than long, 80:66, ratio of interocular space to one eye 48:16; vertex obscurely punctured, ocelli reduced. Antenniferous tubercles blunt, short, wider across base than long. Antennae longer than head and pronotum combined, 196:126, proportion of segments one to four 43:52:49:52. Rostrum attaining base of fourth (third visible) abdominal segment, first segment attaining base of head, proportions of segments one to four 58:56:47:36.

Pronotum at middle slightly shorter than head, 60:66. Anterior lobe strongly rounded, narrower than width across posterior lobes, 95:110, constriction between lobes at about the middle (fig. 7b); disk depressed, lateral lobes prominent, slightly raised in front of callosities, median carina prominent anteriorly and posteriorly, obscured through most of disk.

Scutellum slightly wider than long, 60:54, raised in middle of disk. Hemelytra not at all constricted before expanded portion.

Color dark reddish brown. Pronotum with pale spots at anterior and posterior ends of median carina. Hemelytra with obscure pale spots throughout, membrane hyaline brown. Antennae with segments one and two light brown, three and four dark brown, joints pale. Rostrum light brown with brown apex. Legs pale yellow brown with three light brown annulations on each femur and tibia, tarsi light brown.

Size: male, length 5.4 mm., width (pronotum) 1.8 mm.; female, length 5.4 mm., width (pronotum) 1.8 mm.

Holotype: male, Kaiwiki, Hawaii, Sept. 22, 1918 (O. H. Swezey), (B. P. Bishop Museum). Allotype: female, same data as holotype, (California Academy of Sciences).

The specimen from Lahaina, Maui (Koebele) figured by Kirkaldy (1902; fig. 44) as "villosa" belongs here. The pubescence is only moderately distinct and the costal margins are much more strongly sinuate than in the figure.

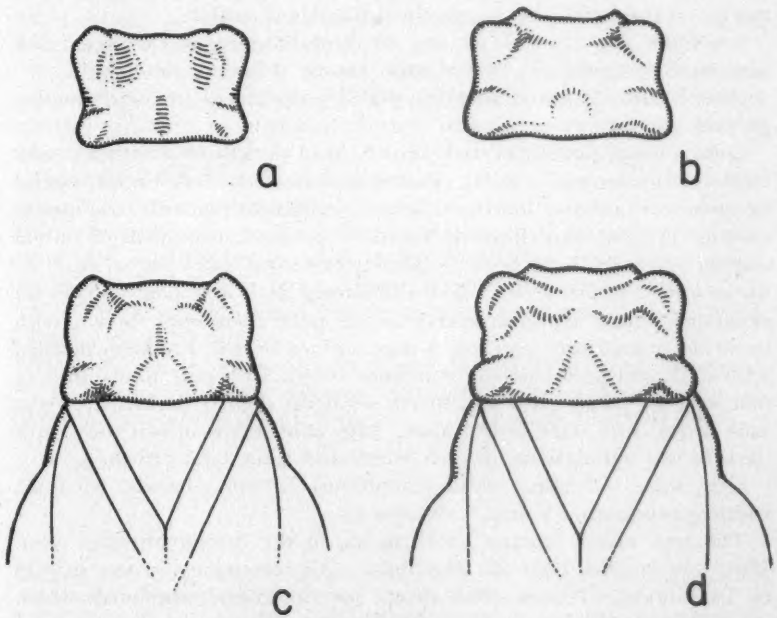


Figure 7. Pronota of: a) *Nesocryptias oahuensis*, n. sp., b) *Nesocryptias xiopsis*, n. sp., c) *Nesocryptias villosa* (B. White), d) *Nesocryptias adamsoni*, n. sp.

Nesocryptias villosa (Buchanan White)

Metrarga villosa Buchanan White, 1878, ANN. MAG. NAT. HIST. (5) 1:371.

Body elongate, obovate. Surface dull, usually covered with appressed clumped hairs on head, thorax, scutellum and curvaceous part of hemelytra. Abdomen and legs with shorter spaces of appressed hairs.

Head a little wider across eyes than long, 72:64; ratio of interocular space to width of an eye 47:11. Vertex finely punctured. Ocelli reduced. Antenniferus tubercles short, slightly wider at base than long, blunt at apex. Antennae longer than head and pronotum together, 185:124, proportion of segments one to four 34:49:55:46. Rostrum attaining middle of third (second visible) abdominal segment, first segment just attaining base of head, proportions of segments one to four 43:55:47:40.

Pronotum at middle slightly shorter than head, 64:60, anterior lobe broadly rounded, narrower than width across posterior lobes, 95:99, constriction between lobes at about the posterior two-thirds (fig. 7c). Disk depressed with humeri and lateral margins of anterior lobe prominent, with raised areas anteriorly to either side of midline, extending through callosities, then diverging laterally, median carina prominent at anterior margin of pronotum, becoming obscure at about middle.

Scutellum about as wide as long, 60:58, glabrous in lateral angles, disk with strongly raised "Y"-shaped area, greatly depressed anteriorly.

Hemelytra with costal margins slightly constricted before expanded portion.

Color brown, punctures dark brown, head dark brown with antenniferous spines somewhat paler. Pronotum anteriorly dark brown, lateral margins and posterior lobe light brown, median carina with pale spot at anterior margin. Scutellum dark brown, posterior two-thirds of lateral margin and apex light brown. Hemelytra brown and opaque, with indistinct pale areas on disk, and alternating dark and pale patches on expanded lateral margins, claval suture pale, membrane brown with indistinct transparent patches. Under surface brown, abdomen mottled with dark and pale patches. Antennae brown with pale joints, base of first segment paler, third and fourth segments slightly darker. Rostrum pale brown with dark brown apex. Legs pale yellow brown with three dark brown annulations on each femur and tibia, tarsi brown.

Size: male, 5.3 mm., width (pronotum) 1.7 mm.; female, 6.0 mm., width (pronotum) 1.9 mm.

The type and a "cotype", both males, in the British Museum (Nat. Hist.) are labelled "No. 25, Honolulu". All records are in the vicinity of Tantalus and Nuuanu Pali except for Blackburn's specimens which are marked only with the Oahu symbol. Three specimens that may belong here are before us from Kauai-Kumuela, Dec. 28, 1935 (R. L. Usinger), and 4000 ft., Mar. 3, 1919 (J. A. Kusche).

Many of the specimens in the series (including the three Kauai specimens) lack the strongly villose vestiture of the described specimens from Blackburn's series, yet agree in all other respects.

Nesocryptias adamsoni, new species

Body elongate obovate, surface shining. Head, lateral margins of pronotum, and bases of costal margins with dense hairs, remaining parts appearing glabrous, but with sparse short hairs throughout.

Head a little wider across eyes than long, 82:72, ratio of interocular space to width of an eye 54:14, vertex obscurely punctate. Ocelli reduced. Antenniferous tubercles short, but longer than wide at base, blunt at apex. Antennae longer than head and thorax combined, 221:143, proportion of segments one to four 51:55:60:55. Rostrum incomplete, first segment surpassing base of head, proportion of segments one and two 65:61.

Pronotum at middle subequal to head, 71:72, anterior lobe broadly rounded, narrower than width across posterior lobe, 105:119, constriction between lobes at about posterior two-thirds (fig. 7d). Disk depressed, particularly behind callosities, lateral margins of anterior lobe and posterior lobe prominent, callosities raised, median carina raised at anterior margin, obscure posteriorly.

Scutellum about as wide as long, 65:67, disk strongly raised medially.

Hemelytra with costal margins slightly arcuate basally, then strongly curving outwardly to expanded portion, which is more rounded than in other species of the genus.

Color reddish brown, head dark reddish brown. Prothorax with a few pale areas between punctures, scutellum with pale apex, hemelytra of nearly uniform color with obscure pale spots in expanded costal area, membrane hyaline brown, with paler spots. Antennae light brown, fourth segment slightly darker. Rostrum and legs light brown.

Size: male, length 5.9 mm., width (pronotum) 2.0 mm.; female, length 6.4 mm., width 2.1 mm.

Holotype: male, Alakai Swamp, Kauai, July 10, 1928 (A. M. Adamson), (B. P. Bishop Museum). Allotype: female, Kumuwela, Kauai, June 27, 1932, on *Osmanthus* (O. H. Swezey), (B. P. Bishop Museum).

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Notes on the Elaterid Genus Eopenthes, Sharp (Coleoptera)[1]

R. H. Van Zwaluwenburg

SANTA ROSA, CALIFORNIA

(Presented at the meeting of September 8, 1958)

The endemic Hawaiian genus *Eopenthes* (subfamily Ampedinae of the coleopterous family Elateridae) is distinguished from the rest of that subfamily by having the sides of the mesosternal cavity perpendicular, or nearly so. The genus was erected by Sharp (2)[2] to include six species described in 1885 (2), three by Blackburn and three by himself, and further included *Elater humeralis* described earlier by Karsch (1). In 1908 Sharp (6) described 26 more species. It is the present writer's opinion that of the species recognized by Sharp, no more than 31 are valid. The types of all the *Eopenthes* except one, are in the British Museum of Natural History; *E. humeralis* (Karsch), I am informed by Dr. J. W. Machatschke, is in the Zoological Museum in Berlin. The type of the genus is *Eopenthes basalis* Sharp designated as such by Hyslop in 1921 (3).

Eopenthes are found in the native mountain forests where the adults are usually swept from vegetation. Their larvae feed in decaying wood (4), and are presumably predaceous on other insects.

Perkins (4: cxxx) wrote: "*Eopenthes* is an endemic genus with 33 described species, many of which are rare and imperfectly known, the species being extremely hard to distinguish. Some have a constant colour pattern, while others are very variable. In the latter case individuals of one species may be of two or three quite different patterns of colour, these same colours being of specific value in other species and not varying. These beetles are remarkable amongst the Hawaiian Coleoptera for several reasons. They are almost entirely summer insects or at least do not occur between November and March. They are almost the only native beetles found visiting flowers for the sake of the nectar, being especially fond of the blossoms of *Metrosideros*. They are also largely of diurnal habits. Unfortunately many of them appear to be rare or this may be

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[2] Numbers in parentheses refer to the bibliography at the end of this article.

partly due to their comparatively short season . . ." Identification of *Eopenthes* in Hawaii has been handicapped by the extreme rarity in local collections of all but a few species (nine of the 33 named forms were described from uniques), and by their confusing variability in coloration. Many of the original descriptions were brief, and often are more comparative than descriptive.

Little specific help is found in the characters of the male aedeagus, although differences in the relative length and breadth of that organ are discernible in some species. The aedeagus is of the tripartite type universal among the Elateroidea (fig. 1, A). In *Eopenthes* it is characterized as follows: (1) the median lobe is longer than the lateral lobes, and is narrowed toward the apex to form a more or less acute tip; (2) the lateral lobes have a "shoulder" at about the middle of their outer margin; above the shoulder they are roughly parallel-sided, with the outer margin rounded at the apex, and the inner ending in a definite angle. The greatest departure from this pattern is found in the aedeagus of *Eopenthes muticus* Sharp (fig. 1, B) in which the outer margin of the lateral lobes is strongly arcuate above the shoulder, and the lobes themselves more strongly produced at the tip.

Sharp (6: 370) published a key to separate the species into four presumably related groups and one individual species, to which he referred by numbers. The present paper gives keys to Sharp's species groups. In treating his largest group (species 6–28) the species have been segregated by island before attempting further separation on morphological differences or on color. So far as is known, all but one of the species of *Eopenthes* are restricted to a single island; the exception is *E. caeruleus* Sharp, taken on both Molokai and Lanai. Of the species recognized by Sharp, six are known from Kauai, 13 from Oahu, six from Molokai, and three each from Lanai, Maui and Hawaii. Sharp's key:

a Color metallic ..... Species 1 and 2
a' Color not metallic
  b Prosternal process not bent upward behind the front coxae ..... Species 3–5
  b' Prosternal process bent upward behind the front coxae
    c Tarsi notably thickened; fourth joint of hind feet not minute
      d Prosternal process before the apex projecting as a sharp denticle ..... Species 6–28
      d' Prosternal process before the apex not denticular ..... Species 29
    c' Tarsi thickened, fourth joint of feet minute ..... Species 30–33

(Line c' could more properly read: "Tarsi thickened, but not notably so", etc.)

Sharp's numbers refer to the following:

1 *caeruleus* Sharp (6: 370) Lanai; Molokai
2 *auratus* Sharp (6: 371) Molokai

3 *basalis* Sharp (2: 153) Oahu
4 *longicollis* Sharp (6: 371) Kauai
5 *humeralis* (Karsch) (1: 5) Maui

6 *obscurus*, Sharp (2:154) Oahu
7 *kauaiensis* Sharp (6: 373) Kauai
8 *germanus* Sharp (6: 373) Oahu
6 *obscurus* Sharp (2:154) Oahu
10 *politus* Sharp (6: 373) Maui
11 *deceptor* Sharp (6: 374) Molokai
12 *perkinsi* Sharp (6: 374) Oahu
13 *divisus* Sharp (6: 374) Oahu
14 *konae* Blackburn (2: 154) Hawaii
15 *cognatus* Sharp (6: 375) Hawaii
16 *celatus* Sharp (6: 376) Molokai
17 *gracilis* Sharp (6: 376) Molokai
18 *mauiensis* Sharp (6: 376) Maui
19 *unicolor* Sharp (6: 377) Kauai
20 *funebris* Sharp (6: 377) Kauai
21 *plebeius* Sharp (6: 377) Lanai
22 *arduus* Sharp (6: 378) Oahu
23 *antennatus* Sharp (6: 378) Oahu
24 *oahuensis* Sharp (6: 378) Oahu
25 *varians* Sharp (6: 379) Molokai
26 *satelles* Blackburn (2: 155) Lanai
27 *tinctus* Sharp (6: 379) Hawaii
28 *ambiguus* Blackburn (2: 155) Oahu

29 *muticus* Sharp (6: 380) Kauai

30 *debilis* Sharp (2: 154) Oahu
31 *parvulus* Sharp (6: 381) Oahu
32 *marginatus* Sharp (6: 381) Oahu
33 *tarsalis* Sharp (6: 381) Kauai

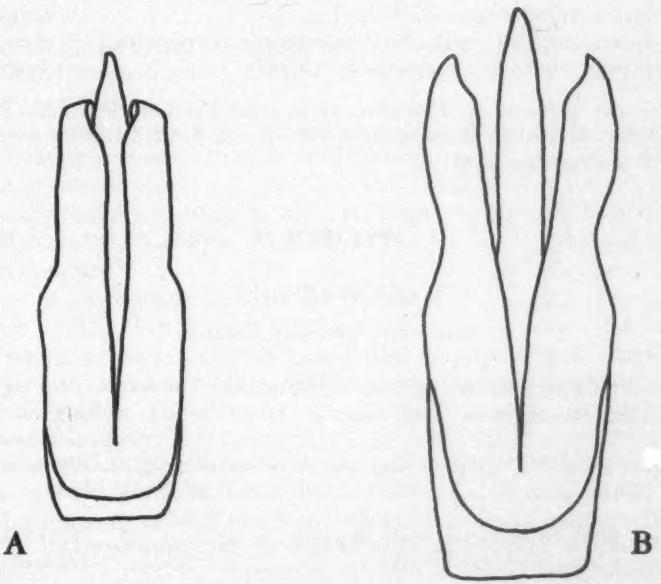

Figure 1. A, Aedeagus of *Eopenthes mauiensis* Sharp, type (British Museum), Haleakala, Maui, 5000 ft., Perkins, May 1896; typical form of nearly all species of *Eopenthes*.
B, Aedeagus of *Eopenthes muticus* Sharp, type (British Museum), High plateau, Kauai, Perkins, August 1896; the most aberrant form of aedeagus in the genus.
(Both figures are greatly enlarged in approximately the same degree)

SPECIES 1–2

caeruleus, auratus

The color differences implied by their names are sufficient to separate these species. *E. auratus* was described from a unique male taken at 4000 ft. on Molokai. *E. caeruleus* is the only member of the genus known from more than a single island; it occurs on Molokai as well as on Lanai.

SPECIES 3–5

basalis, longicollis, humeralis

1. Antennae black except for segments 1 and 2 (and sometimes 3) which are rufous; elytra strongly spinose (Oahu) ..... (3) **basalis**
   Antennae wholly black 2

2. Dorsum uniformly black, or with base of elytra briefly rufous; elytra strongly spinose (Kauai) ..... (4) **longicollis**
   Dorsum blackish, with basal one-fourth to one-third of elytra rufous; elytra finely mucronate (Maui) ..... (5) **humeralis**

E. basalis is found on Tantalus and in other parts of the Koolau Range on Oahu; *longicollis* at from 2000–3000 ft. on Kauai; and *humeralis* at 3000 ft. on Haleakala, Maui.

SPECIES 6–28

KAUAI SPECIES

kauaiensis, unicolor, funebris

1. Apex of elytra neither spinose nor mucronate; antennae and legs blackish; segment 4 of anterior tarsus nearly as long as 3 ..... (19) **unicolor**
   Apex of elytra spinose; segment 4 of anterior tarus distinctly shorter than 3 2

2. Legs more or less uniformly blackish ..... (20) **funebris**
   Legs rufous with tarsi dusky ..... (7) **kauaiensis**

Only females of *kauaiensis* are known, while *funebris* and *unicolor* are known only from males. All three occur at from 3000 to 4000 ft. on the high plateau above Waimea. Each is represented in the British Museum by two specimens.

The second specimen of *kauaiensis* is labeled "var." (probably by Sharp), and differs from the type female as follows:

kauaiensis type female

1. Hind angles of prothorax moderately acute.
2. Scutellum rather robust; widest across middle, thence narrowed to apex.

kauaiensis "var." female

1. Hind angles extremely acute and fine.
2. Scutellum more slender; narrowed from anterior margin to apex.

The variety of *kauaiensis* agrees better with *funebris* than with the type of *kauaiensis*. It may be the female of *funebris* despite color differences in the legs.

OAHU SPECIES

obscurus, perkinsi, antennatus, germanus, divisus, oahuensis, pallipes, arduus, ambiguus

1. Pronotum and elytra (except suture) mahogany colored; head and elytral suture black ..... (12) **perkinsi**
   Not so colored 2
2. Elytra yellowish on basal one-half or more, black an apex, the division between the colors well-defined ..... (13) **divisus**
   Not so colored 3
3. Dorsum uniformly blackish or dark fuscous except for base of elytra which is flavous ..... (24) **oahuensis**
   Not so colored 4
4. Apex of elytra finely but definitely spinose 6
   Apex of elytra briefly, weakly spinose 5
5. Antennal segment 3 slightly longer than 2; interval 3 of elytra markedly elevated at base; sides of prothorax more arcute than in *obscurus* ..... (8) **germanus**
   Antennal segment 3 not longer than 2; interval 3 of elytra only slightly elevated near base; sides of prothorax narrowed forward in straight line from base of hind angles ..... (6) **obscurus**
6. Color generally reddish to ochraceous; head, anterior margin and disc of pronotum, and sometimes sides and suture of elytra, black ..... (28) **ambiguus**
   Color piceous black or brown 7
7. Uniformly piceous black; pronotum strongly convex behind; hind angles of prothorax definitely divergent from outline of sides ..... (9) **pallipes**
   Brown or brownish; pronotum moderately convex behind; hind angles of prothorax only weakly divergent at most 8

8. Brown, head and anterior part of pronotum blackish; prothorax more arcuate on sides, less convergent anteriorly, and hind angles more weakly divergent than in *antennatus* (7.5–8.5 mm.) ---------- (22) **arduus**

Reddish brown, head and disc of pronotum blackish; prothorax more arcuate on sides, less convergent anteriorly, and hind angles more weakly divergent than in *antennatus* (7.5–8.5 mm. ---------- (23) **antennatus**

E. germanus is known only from the unique female in the British Museum, and comparison with *obscurus* of the outline of the pronotum is based on females of both species; comparison of prothoracic characters in the case of *antennatus* and *arduus* is based on males, inasmuch as only males of the latter are known. Clear separation of *antennatus* and *arduus* is difficult. As described, *arduus* is somewhat smaller and less depressed than *antennatus,* and has the sides more arcuate and less strongly convergent in front. In addition, the hind prothoracic angles diverge less perceptibly from the outline of the sides in *ardus* than in *antennatus.* No definite aedeagal differences serve to separate the two.

Sharp (6:378) compares *ardus* and *ambiguus* as follows: "it is considerably larger and broader than *E. ambiguus,* and the coloration though variable in both appears never to quite agree: the feet are not black in *E. arduus,* and the thorax is not red with a large black patch on the middle, but is either nearly red or nearly black." The prothorax of *ambiguus* in the British Museum appeared to me to be basically yellowish instead of reddish, but the colors may have faded.

E. ambiguus was described from a single specimen taken by sweeping at the head of Palolo Valley, Oahu at 2000 ft.; the type is a male bearing a coded label indicating that it was from the Koolau Range, Oahu.

E. pallipes, known only from the unique female in the British Museum, is distinct from the other species in this group, but Sharp (6: 373) suggested that it so closely resembles *E. cognatus* from the island of Hawaii that the validity of the Oahu species is doubtful. From *antennatus, pallipes* can be distinguished (comparison made of females) by the greater length of the prothorax, compared with its width.

Field data on most of these Oahu species are meager. *E. divisus* was beaten from "ohia" *(Metrosideros)* blossoms on the ridge between Manoa and Palolo; *obscurus* and *perkinsi* were taken at elevations of from 2000 to 3000 ft. in the mountains near Honolulu.

MOLOKAI SPECIES
deceptor, gracilis, celatus, varians

1. Punctation on disc of pronotum strong, close-set, separated by spaces equal to about the diameter of the punctures.....(25) **varians**
Punctation finer, sparser, punctures separated by at least twice their diameter..... 2
2. Basal slope of pronotum with sharply incised median groove.....(11) **deceptor**
Median groove on basal slope wide or vague, not sharply incised..... 3
3. Basal slope of pronotum abrupt, widely grooved; femora rufous, rest of legs blackish.....(17) **gracilis**
Basal slope gently, vaguely grooved at most; coloration of legs uniform.....(16) **celatus**

E. deceptor is known only from the unique female, and *celatus* from two males in the British Museum. Of *celatus*, Sharp (6: 376) wrote that ". . . it appears to be most like *E. konae*, but the elytra are not spinose at the tip, and the antennae and tarsi are rather more elongate . . . it agrees in most other respects with *E. konae*." *E. gracilis* also is said to be extremely close to *konae*. Specimens of *varians* have been taken at 4000 ft. in the Molokai mountains.

LANAI SPECIES

plebeius, satelles

Insects of moderate size (9–9.75 mm.); pubescence coarse on pronotum; head brown to obscure, not definitely black.....(21) **plebeius**
Smaller species (7–7.75 mm.); pubescence on pronotum moderately coarse; head definitely black.....(20) **satelles**

Only males of *plebeius* are known. The original description of *E. satelles* (2: 155) is initialed "D.S.", but from the context was obviously written by Blackburn; later (6: 379) it was credited to Blackburn by Sharp. The probable type of *satelles* is a female (7 mm. long) in the British Museum, collected at Koele, Lanai in July at 2000 ft. while sweeping ferns.

MAUI SPECIES

mauiensis, politus

Elytra finely spinose at tip; legs yellowish with tarsi entirely, tibiae partially or entirely, blackish.....(18) **mauiensis**
Elytra not spinose at tip; legs uniformly yellowish.....(10) **politus**

E. politus is known only from the unique female in the British Museum. Both sexes of *mauiensis* are present there, as well as a third specimen labeled by Sharp: "*E. mauiensis* var. *nigripes* D.S.", the legs of which are entirely black. Both *politus* and *mauiensis* have been taken on Haleakala at 5000 ft.

HAWAII SPECIES

cognatus, konae, tinctus

1. Hind angles of prothorax prolonged and very acute; interval 3 of elytra not prominent toward base.....(27) **tinctus**
   Hind angles only moderately acute; interval 3 of elytra prominent toward base..... 2
2. Pubescence brownish, rather long on pronotum; pronotal punctation somewhat coarser, and body more robust than in *cognatus* .....(14) **konae**
   Pubescence blackish, not remarkably long; pronotal punctation finer and body more slender than in *konae* (15) **cognatus**

The probable type of *E. konae* is a male (8 mm. long) labeled *Eopenthes konae* Blackb., and with a symbol on the mounting card identifying it as from the island of Hawaii. According to Blackburn, he had one specimen, taken in flight at Kona, at an elevation of 5000 ft. There are over 200 specimens under this name in the British Museum, 75 of them labeled as *konae* or variety. Perkins (5: cxxx) remarked that *konae* ". . . a very varable species, is very abundant and widely distributed on Hawaii and is found in all sorts of situations, even under stones."

Six specimens of *E. cognatus* are in the British Museum: a type male, a type female; a male and a female "Ind. type D.S." (typical individuals); and two males labeled "var." One of these last has uniformly blackish legs. The basal prominence on the third intervals of the elytra, in both *konae* and *cognatus,* is more noticeable because of the depressed fourth interval. I not only concur with Sharp's remark (6: 376) that *cognatus* is somewhat doubtfully distinct from *konae,* I consider them conspecific.

E. tinctus is known only from the unique male in the British Museum.

SPECIES 29

E. muticus, described from a male taken at 4000 ft. on the high plateau of Kauai, is the only species in the genus to combine the following characters: non-metallic in color; mucro bent upward behind the fore coxae and not denticulate at its apex; tarsi notably thickened, segment 4 of the hind tarsi not especially small. Only males are known.

This species exhibits the greatest deviation from the typical *Eopenthes* form of aedeagus. The outer margin of the lateral lobes is strongly arcuate between shoulder and apex; the tip of each is more or less acutely produced (fig. 1, B).

SPECIES 30–33

debilis, marginatus,
parvulus, tarsalis

1. Tarsi of fore legs notably thickened (Kauai).....(33) **tarsalis**
   Tarsi thickened but not notably dilated (Oahu)..... 2
2. Elytral striations strongly marked.....(30) **debilis**
   Striations weaker 3
3. Brown insects (only females known).....(31) **parvulus**
   Black and yellowish insects (only males known).....(32) **marginatus**

E. tarsalis is known only from the unique female collected in July at 3000 ft. on Kauai. The type of *debilis* is a female, taken sweeping ferns on Oahu at 2500 ft. in the Waianae Mountains.

Among museum material I have seen in Hawaii and elsewhere, *parvulus* specimens are invariably females, and *marginatus* always males. Field populations occurring together on *Scaevola* blossoms in the Oahu mountains likewise consist of female *parvulus* and male *marginatus* (7). Sharp's suggestion (6: 381) that the two constitute a single sexually dimorphic species is undoubtedly true, and the name *parvulus* has positional page priority over *marginatus.*

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A New Species of Odynerus from the Hawaiian Islands (Hymenoptera: Vespidae)

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(Presented at the meeting of October 13, 1958)

This paper contains the description of a new species of *Odynerus* from Niihau. The only *Odynerus* previously reported from that island is *O. soror* Perkins (Fullaway, 1947).

Six female specimens of *Odynerus,* along with other Hymenoptera from Niihau, were presented to the author for identification by Mr. John W. Beardsley, who had received them from Dr. L. D. Tuthill. I am grateful to Mr. Beardsley and Dr. Tuthill for the privilege of studying this material.

Odynerus niihauensis, new species

Female. 11–12 mm. long. Black, robust, body with whitish pubescence; wing pitchy black with slight bluish iridescence. Head, thorax, and scape of antenna black; legs, abdomen and flagellum of antenna ferruginous; a small median flavous spot slightly above antennae, and a small yellow spot on posterior margin of each eye. Apex of clypeus deeply emarginate. Head, thorax, scutellum, and postscutellum sparsely, lightly punctured. Scutellum with a median longitudinal furrow, its anterior end with a small cluster of setae. Postscutellum with a low, Y-shaped raised line anteriorly; its posterior margin emarginate medially. Propodeum dull and coarsely rugose. Basal abdominal segment with scattered large punctation; rest of abdomen with dense medium-sized punctures. Second abdominal sternite with long curved costae in middle. Costae narrowly separated by deep grooves; posterior margin of costate area flat, shiny and triangular-shaped (fig. 1).

Male. Unknown.

Holotype: Niihau, Aug. 1947, L. D. Tuthill collector (Experiment Station, HSPA). Paratypes: Four specimens, same date as holotype (Bishop Museum and University of Hawaii).

In general, this species appears closely related to *O. lipocharis* Perkins, except that the front and mesonotum are more coarsely and closely punctured, and there is a shallow depression at the apex of the costate area. The punctation of the front and mesonotum of *O. konanus* Perkins, a

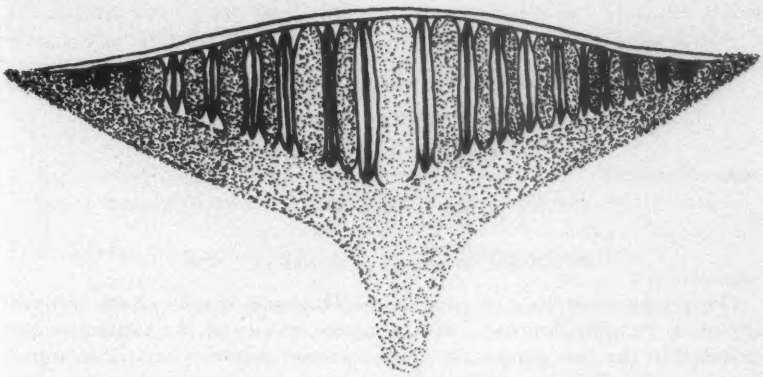

FIG. 1. *Odynerus niihauensis*, anterior portion of second abdominal sternite

species allied to *O. lipocharis*, is similar to that of *O. niihauensis*, but the posterior apex of the costate area has a wider and shallower depression. The costate areas of *O. kirbyi* Dalla Torre and *O. kauaiensis* Perkins resemble that of the new species in that their posterior margins are flat, shiny, and triangular; the middle costae are curved and long; and the distance between costae is narrow

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Revision of the Hawaiian Pemphredoninae (Hymenoptera: Sphecidae)

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(Presented at the meeting of December 15, 1958)

The present study is a revision of the Hawaiian species of the sphecid subfamily Pemphredoninae. All the native species of the subfamily are included in the two genera *Deinomimesa* and *Nesomimesa*. Two introduced genera, *Stigmus* and *Passaloecus*, are represented each by a single species. Keys to the subfamilies of Hawaiian Sphecidae are included to facilitate separation of the pemphredonines.

Very little of the biology of Hawaiian pemphredonine wasps is known. Since other pemphredonines visit flowers for their nectar it is believed the Hawaiian species do also, but no host plants have been recorded.

Species of *Nesomimesa* and *Deinomimesa*, insofar as known, are fossorial wasps which make their nests in the ground or in dead plant stems, provisioning their young with paralyzed flies or leafhoppers. The female of *N. antennata* Perkins preys upon several families of Homoptera and one family of Diptera. The host records include: a tipulid fly (Perkins, 1899); a cixiid, *Oliarus* sp. (Williams, 1927); and a flatid, *Siphanta acuta* (Walker), (Williams, 1927). Williams (1927) described the habits of *Nesomimesa hawaiiensis* Perkins and stated that it preyed upon *Perkinsiella saccharicida* Kirkaldy (Delphacidae). He found the nests, each of which consisted of a single burrow which terminated in several cells, in a bank of earth. Timberlake (1920) reported that *Deinomimesa haleakalae* Perkins preyed on mature and immature *Nesophrosyne* sp. (Cicadellidae) and nested in horizontal burrows along banks of trails. Bridwell (1915) observed a female of *N. antennata* nesting in a dead stem of *Erigeron*.

I have examined many specimens during this study, including paratypes of the species described by Perkins which are housed in the Bishop Museum. The female of *Nesomimesa punae* Perkins was not available in the Bishop Museum collection. However, Dr. J. L. Gressitt examined the type specimen of *N. punae* at the British Museum (Nat. Hist.), London, and provided photographs and notes which enabled me to identify a single female of this species in the Hawaiian Sugar Planters' Association collection.

I am indebted to many persons for assistance during the course of study. Special appreciation is extended to Dr. J. Linsley Gressitt, who suggested this problem and to Dr. Larry W. Quate and Mr. J. W. Beardsley, who

advised me during the preparation of this manuscript. Also, the aid of Miss Carole Worthington, Mr. Shinsaku Kimoto, and my wife, Reiko, is appreciated. I am grateful to the Hawaiian Sugar Planters' Association for the loan of their insect specimens.

KEY TO THE SUBFAMILIES OF HAWAIIAN SPECIDAE

1. Inner margin of compound eyes deeply emarginate ... **Trypoxyloninae**
   Inner margin of eyes unemarginate or very shallowly emarginate ... 2
2. Inner margins of compound eyes widely divergent at vertex ... **Crabroninae**
   Inner margins of compound eyes straight, concave or convex, but not widely divergent at vertex ... 3
3. Third submarginal cell narrow, sigmoid shaped ... **Larrinae**
   Third submarginal cell narrow, broadly truncate, or petiolate; not sigmoid ... 4
4. Marginal cell broadly truncate at apex ... **Astatinae**
   Marginal cell rounded or pointed at apex ... 5
5. Middle tibia with two apical spurs; petiole cylindrical ... **Sphecinae**
   Middle tibia with a single apical spur; petiole subcylindrical ... **Pemphredoninae**

The subfamily Pemphredoninae is represented in Hawaii by four genera, two of which have only a single species here. One of these, *Stigmus inordinatus* Fox, was listed by Perkins (1910) on the basis of a single specimen taken in Honolulu. This species has not been reported in Hawaii since, and it seems possible that the specimen may have been misidentified or erroneously labeled. *Passaloecus luzonensis* (Rohwer) from the Philippines was first collected in Hawaii in 1945 by Williams (PROC. HAW. ENT. SOC. 12:480, 1946).

KEY TO THE GENERA OF PEMPHREDONINAE FOUND IN HAWAII.

1. Fore wing with two discoidal cells; one recurrent vein present ... **Stigmus**
   Fore wing with three discoidal cells; two recurrent veins present ... 2
2. Third discoidal cell truncate; abdomen subsessile ... **Passaloecus**
   Third discoidal cell not truncate; abdomen petiolate ... 3
3. Propodeum with strongly raised lines; petiole generally stout, distinctly carinate. Female with labrum exposed; fore femur in most cases enlarged. Male with anterior margin of clypeus slightly emarginate ... **Deinomimesa**
   Propodeum smooth or with weakly raised lines; petiole generally elongate and smooth. Female with labrum not exposed; fore femur not swollen. Male with anterior margin of clypeus slightly pointed or rounded ... **Nesomimesa**

The head structures of the female sex present taxonomic characters useful in separating our endemic species of pemphredonines. The females of *Deinomimesa* may be separated easily by means of the shape of clypeal margin. In *Nesomimesa* the genal spines of the females, when well developed, provide a convenient character for the separation of species; however, these spines are sometimes very poorly developed, particularly in smaller specimens.

The ventral apex of petiole is subject to interspecific variation in both sexes and is valuable in both identification of the species and association of the sexes. In *Nesomimesa* the ventral apex of the petiole is generally smooth, shiny, more or less rounded, and bears a membranous (figs. 12, 13, 14, 16) or semi-membranous (figs. 15, 17) area. The latter is sclerotized at least on the lateral portions. These areas vary in length and width, and are bordered by sclerotized bands which project medially and posteriorly in different shapes and forms. In *Deinomimesa* the ventral apical structures of the petiole are much more well defined than in *Nesomimesa*. The surface of the pre-membranous area of *Deinomimesa* is shiny, generally flat, and of various outlines in the middle. Large punctures and a carina are present in the lateral areas (figs. 19–22). The membranous of semi-membranous areas also vary in length and width as in *Nesomimesa* (figs. 19–22), and the sclerotized bands bordering the membranous areas differ in size and shape.

The structures mentioned above have not been used previously as taxonomic characters but were found useful in separating the Hawaiian pemphredonine wasps.

Genus **Nesomimesa** Perkins

Nesomimesa Perkins, 1899, FAUNA HAWAIIENSIS 1 (1) :8 (Type: *Nesomimesa hawaiiensis* Perkins. Subsequent designation by Pate, 1937).

Medium or small-sized black species; male elongate and female robust. Fore wing 5 - 10 mm. long.

Clypeus densely pilose, short, broad, and elevated at base in female; truncate and slightly raised at middle in male. Mandible long, extending beyond clypeal margin in female; mandible short, partially hidden under clypeus in male. Antennae clavate in female, subclavate in male. A conspicuous, broad, flat spine of variable size present beneath gena in female; sometimes greatly reduced in *N. hawaiiensis, N. antennata,* and *N. nitida.* Second cubital cell of fore wing petiolate or narrow at radius and a little wider below. Second recurrent vein sigmoid, arising from second intercubital vein. Head and thorax with punctures of two different sizes. Fore tarsus testaceous in male and ferrugineus in female; base of hind tarsus armed with stout spines along both sides. Propodeum pubescent to pilose

and with fewer raised lines than *Deinomimesa*. Abdomen smooth and shiny. Petiole 3.6 to 10 times as long as maximum width. Ventral apex of petiole with membranous or semi-membranous area enclosed posteriorly by a medially rounded sclerotized band; followed by a deep rectangular depression which rises apically in a gradual incline. Ventral apex of the petiole triangular-shaped and attached to the second abdominal sternite at the corners; its surface moderately concave. Membranous or semi-membranous area between petiole and sternite of second abdominal segment semi-elliptical in outline, in either a horizontal or a vertical plane. Center of membranous area with a small depression in some species. A sclerotized band with a median projection situated posterior to the membranous area (figs. 12–16). Pygidial area flattened, punctured, with appressed spines, and subcarinate along its edges. Genitalia (figs. 1–6) similar in size except in *N. kauaiensis*.

Key to Species of Nesomimesa

1. Fore wing pitchy black; membranous area with small a depression in middle, bordered by a posteriorly curved band which is weak laterally but becomes wider medially (fig. 16); female with genal spine straight, its apex tapering to a blunt point when not reduced (fig. 26) ..... **sciopteryx**

   Fore wing lighter in color, infuscate to subhyaline; membranous or semi-membranous areas bordered by various sized bands, not as above (figs. 12, 13, 14, 15, 17) 2

2. Ventral apex of petiole with a minutely punctate semi-membranous area sclerotized at least laterally 3

   Ventral apex of petiole with an impunctate entirely membranous area 4

3. Semi-membranous area 4–5 times as long as wide, bordered posteriorly by a heavy medially rounded band (fig. 15); female with genal spines distinctly curved forward and sharply pointed at apex when fully developed (fig. 27) ..... **kauaiensis**

   Semi-membranous area 10 times as long as wide, developed into deep furrow and bordered posteriorly by a large punctured band with a small oval-shaped depression in middle (fig. 17); female unknown ..... **perkinsi**

4. Mesonotum and scutellum dull; membranous area 6–7 times as long as wide, bordered posteriorly by a narrow band which gradually broadens toward middle (fig. 12) ..... **hawaiiensis**

   Mesonotum and scutellum shiny; band otherwise (figs. 13, 14) 5

5. Membranous area bordered posteriorly by large flat crescent-shaped band (fig. 14) ..... **nitida**

   Membranous area with small round depression in middle supported apically by narrow band of medium size (fig. 13) ..... **antennata**

Nesomimesa hawaiiensis Perkins (figs. 1, 12, 23).
Nesomimesa hawaiiensis Perkins, 1899.

Male. Length 6.5 - 10 mm. Fore wing infuscate. Third antennal segment 5.0 - 6.6 times as long as second. A blunt, pyramid-shaped point produced between antennae. Distance between antennae 1.8 - 2.0 times length of second antennal segment. Frontal carina low, broken in places, reaching anterior ocellus.

Groove between metapleural pits shiny and shallow; pits small. Posterior metapleuron pilose. Scutellum somewhat rounded and shiny; postscutellum rugose at base. Tarsal comb of fore leg with approximately 40 separated teeth.

Anterior part of propodeum polished, its lateral areas with minute raised lines curving toward a deep elongate median groove. Petiole 5.0 - 10 times as long as maximum width, rounded above and flattened at sides, with a low carina along each lateral margin; underside of petiole rounded. A small depression at base of second abdominal tergite. Ventral apex of petiole with membranous area in a horizontal plane, 6–7 times as long as wide, bordered apically by a narrow band gradually expanding medially (fig. 12). Apical segment of gonocoxite (fig. 1) 5 times as wide as width of gonostylus; with many medium-sized setae. Gonostylus 10 times as long as broad; inner and outer margins with minute setae. Volsella with minute spines and setae on outer edge.

Female. Length 11 - 13 mm. Similar to male except as follows: Fore wing subhyaline, its apex infuscate. Genal spine 0.10 - 0.13 mm. wide at middle, inner edge twisted through 90 degree angle near the base and carried slightly forward, apical portion of spine rather sharply pointed (fig. 23). Spine sometimes reduced; short and narrow or stubby and triangular-shaped. Third antennal segment 6.8 - 7.0 times as long as second. Edge of preoccipital ridge 0.05 mm. wide.

Groove between metapleural pits shiny and deeply sculptured; pits large. Scutellum flat and somewhat dull.

Anterior part of propodeum bare and shiny, with a faint median longitudinal groove; lateral areas rugulose. Base of propodeum with a few raised lines. Petiole 5 times as long as maximum width; rounded above.

Specimens examined. Paratypes at Bishop Museum: 7 males, 8 females, Kau, Hawaii, 1,200 m. June, Aug., Sept., 1895; 1 male, 1 female, Kona, Hawaii, 950 m., 1,200 m., Aug., 1894, 1896; 9 males, 1 female, Kilauea, Hawaii, June, July, 1906; 1 female Hualalai, Hawaii, 1,200 m., 1892, R.C.L. Perkins.

HAWAII: male, Kaumana, Apr., O. H. Swezey; male, Keanaholu, 1,643 m., Oct., O. H. Swezey and F. X. Williams; 14 males, 14 females, Kilauea, 1,200 m., May, June, July, Aug., Sept., W. M. Giffard, E. H. Bryan, Swezey; 5 males, 5 females, dry forest, July, Giffard; 3 males, female, Glenwood Olaa, 720 m., May, Giffard; 18 males, 15 females; Pa-

hala, Mar., Apr., May, June, Nov., Dec., Williams, Swezey, N. Fujioka; 4 males, Honaunau, July, Giffard; male, Judd Trail, Aug., Swezey; male, Hualalai, 2,000 - 2,200 m. Aug., Williams (BISHOP, HSPA).

This species resembles *N. antennata,* but the genal spine, when fully developed, is 0.10 to 0.13 mm. wide in *hawaiiensis* and 0.16 to 0.23 mm. wide in *antennata.* The apex is more or less directed vertically in *hawaiiensis* rather than being curved away from the body. Female specimens with short spines are difficult to distinguish. In both sexes of *antennata* the apex of the petiole has a wider band (fig. 13) than does *hawaiiensis* (fig. 12). The mesonotum is shiny in *antennata* and rather dull in *hawaiiensis.*

Nesomimesa antennata Perkins (figs. 2, 13, 24).

Nesomimesa antennata Perkins, 1899.

Male. Length 7 - 13 mm. Fore wing infuscate marginally, hyaline toward its base. Third antennal segment 6.0 times as long as second. An acute cone-shaped point between antennae. Distance between antennae 1.8 - 2.0 times length of second antennal segment. Frontal carina low, elongate, nearly reaching anterior ocellus. Scutellum and postscutellum shiny. Tarsal comb of fore leg crescent-shaped with 30 - 32 teeth set close together.

Groove between metapleural pits shiny, deep, and narrowly elongate; pits small; posterior metapleuron pilose.

Anterior part of propodeum dull and bare. Center of propodeum with a deep, wide, sculptured groove; median raised lines paralleling each side of groove. Petiole 5 times as long as maximum width, rounded above, more or less flattened at its sides, and rounded beneath. A small depression at base of second abdominal tergite. Ventral apex of petiole with membranous area in a vertical plane, 8 times as long as wide, bordered apically by narrow band; a small median depression anterior to the band (fig. 13). Apical segment of gonocoxite 3 times as wide gonostylus; with a cluster of minute setae and a few scattered medium-sized setae posteriorly. Gonostylus 7.5 times as long as broad; a few setae present at its apex. Volsella with a row of minute setae at inner edge.

Female. Length 10 mm. Similar to male except as follows: Genal spine when fully developed 0.16 - 0.23 mm. wide at middle; inner edge twisted through 90 degrees and carried slightly forward so that the apical portion is somewhat forward of base. Apex of spine twisted at right angle and not truncate (fig. 24). Spine sometimes reduced, short, and narrow or triangular-shaped. Third antennal segment 6.2 times as long as second. Distance between antennae 2.5 times length of second antennal segment. Edge of preoccipital ridge 0.06 mm. wide.

Groove between metapleural pits shallow, wide, shiny, and sculptured; pits large. Scutellum somewhat rounded and very shiny.

Anterior part of propodeum shiny and without setae. Base of propodeum with a few raised lines; a narrow, elongate, shiny median groove hidden beneath long setae. Petiole 4 times as long as maximum width, rounded above.

Specimens examined. Paratypes at Bishop Museum: 4 females, 4 males. Waianae Mts., Oahu, 600 m., Apr., 1892, R.C.L. Perkins; male Koolau Range, Oahu, 600 m., Oct., 1893; female, 4 males, Kaala Mts., Oahu, 600 m., Mar., 1892; 6 males, Honolulu, Oahu, 600 m., Sept., 1892, R.C.L. Perkins; 9 females, Honolulu Mts., Oahu, 450 m., probably 1892, R.C.L. Perkins.

OAHU: 10 males, 2 females, Kuliouou, Mar., June, Aug., O. H. Swezey, E. H. Bryan; 7 males, 2 females, Palolo Crater, July, Aug., J. F. Illingworth, Swezey; 7 males, Mt. Olympus, Feb., July, Swezey; female, Manoa, Mar., Bryan; 20 males, 22 females, Tantalus, 450 m., 570 m., Jan., Mar., Apr., June, July, Sept., Oct., Perkins, W. M. Giffard, Swezey; 2 males, Nuuanu Mts., 600 m., Mar., Giffard, Bryan; male, Konahuanui, July, Bryan; male, female, Kahauiki, Nov., Dec., Swezey; female (ex. window) Cooke Trail, Mar., June, Swezey; 2 males, female, Pacific Hts., Dec., Swezey; 3 males, Kalihi Ridge, Apr., Bryan; female, Moanalua, Oct., Bryan; 3 males, female, Oahu Mts. (T.H.) Giffard; 2 males, 2 females, Hawaiian Is. (no dates), T. Blackburn; male, 3 females (no dates), Koebele; 4 females, Mt. Kaala, July, Sept., J. C. Bridwell, Swezey; male, Wahiawa, June, Swezey; 3 males, Kaukonahua, June, Bridwell; male, 5 females, Waialua, 570 m. Perkins (BISHOP, HSPA).

The membranous area of *antennata* is in a vertical plane whereas it is in a horizontal plane in *hawaiiensis;* and the central depression is smaller than that of *hawaiiensis.*

Nesomimesa nitida Perkins (figs. 3, 14, 25).

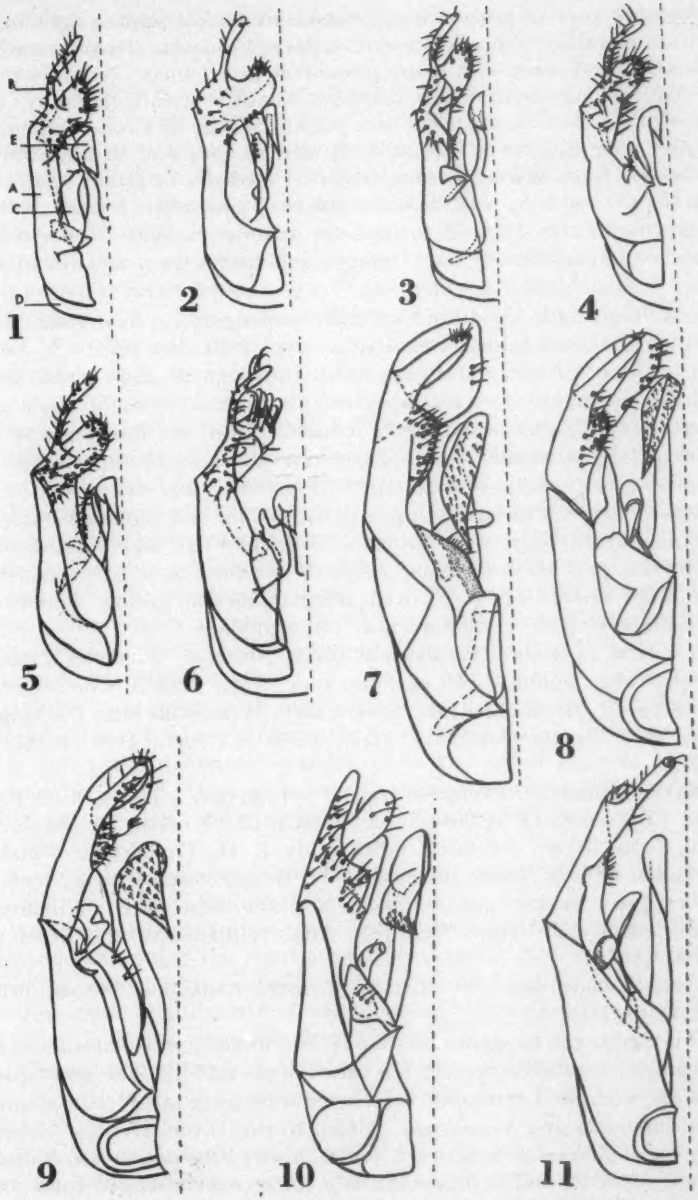
Nesomimesa nitida Perkins 1899.

Male. Length 7 - 10 mm. Fore wing infuscate and slightly violet iridescent. Third antennal segment 6.0 times as long as second. A rather noticeable pyramid-shaped point between antennae. Distance between antennae 2.0 times length of second antennal segment. Frontal carina low and elongate, slightly raised in middle, reaching anterior ocellus.

Groove between metapleural pits shiny, shallow, and shorter than usual length; pits large. Scutellum and postscutellum shiny. Tarsal comb of fore leg with approximately 45–50 teeth closely set together.

FIGS. 1–6.Genitalia of *Nesomimesa.* 1, *N. hawaiiensis*: A, gonocoxite; B, gonostylus; C, volsella; D, gonobase; E, penis; 2, *N. antennata;* 3, *N. nitida;* 4, *N. sciopteryx;* 5, *N. perkinsi;* 6, *N. kauaiensis.*

FIGS. 7–11. Genitalia of *Deinomimesa.* 7, *D. hawaiiensis;* 8, *D. punae;* 9, *D. ferox;* 10, *D. haleakalae;* 11, *D. cognata.*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Anterior part of propodeum polished, its middle with a light longitudinal marking. Propodeum with a deep, V-shaped, elongate, median groove; lateral areas with many prominent raised lines. Petiole 4 times as long as maximum width, rounded above, flattened laterally, and rounded beneath. A small flat area present at base of second abdominal tergite. Ventral apex of petiole with membranous area in a horizontal plane, 6–7 times as long as wide, bordered medially by a thick, flat, crescent-shaped band (fig. 14). Apical segment of gonocoxite 3 times as wide as gonostylus (fig. 3); with many setae at outer margin. Gonostylus 6 times as long as broad; inner margin and base with a row of minute setae. Volsella similar to *antennata*.

Female. Length 10 - 12 mm. Similar to male except as follows: Fore wing entirely subhyaline. Genal spine when fully developed 0.26 - 0.33 mm. wide at middle; inner edge twisted through 90 degrees near base and carried slightly forward; apex of spine twisted at right angle and truncate (fig. 25); spine sometimes reduced. Third antennal segment 6.5 times as long as second. Distance between antennae, 2.5 times length of second segment. Edge of preoccipital ridge 0.06 - 0.07 mm. wide.

Groove between metapleural pits shiny, shallow and V-shaped; anterior metapleural pit larger than posterior. Scutellum flat, highly polished.

Anterior part of propodeum distinctly polished; base of propodeum with a few raised lines and a deep, elongate, median groove. Petiole 4 - 4.5 times as long as maximum width, rounded above.

Specimens examined. Paratypes at Bishop Museum: 3 females, 8 males, Molokai Mts., Molokai, 950 m. May, June, Aug., 1893; 5 males, female, Koele, Lanai, 600 m. Jan., July, 1894; female, West Maui Mts., Iao Valley, May, 1896; female Haleakala, Maui, 1,500 m., Sept., 1896, R. C. L. Perkins.

MAUI: female, Honomanu, June, E. H. Bryan; 9 males, Kula Pipe Line, June, Aug., O. H. Swezey, R. R. Whitten; 2 males, female, Halehaku, June, Bryan; 4 males, Ukulele, July, P. H. Timberlake; 6 males, 6 females, Olinda, June, July, N. L. H. Krauss, Swezey; male, female, Kailua, June, Bryan; male, 2 females, Wailuku, Sept., F. X. Williams; 4 males, female, Iao Valley, May, July, Aug., Williams, Swezey (BISHOP, HSPA).

LANAI: male, Apr., W. M. Giffard; male, Lanaihale, 980 m., June, D. E. Hardy (HSPA).

This species can be separated from *N. antennata* and *N. hawaiiensis* by the elongate frontal carina which is raised in the middle. The genal spine of *nitida*, when well developed, is truncate at the apex rather than pointed as in *antennata* and *hawaiiensis*. Added to this is the fact that in both sexes the membranous area of the ventral apex of the petiole is 6–7 times as long as broad, and is supported by a thick crescent-shaped band protruding in the middle.

Nesomimesa sciopteryx Perkins (figs. 4, 16, 26).

Nesomimesa sciopteryx Perkins, 1899.

Male. Length 8 - 9 mm. Fore wing pitchy black with a slight violet iridescence. Clypeal margin somewhat tridentate. Third antennal segment 4.8 times as long as second. A short acute point produced between antennae. Distance between antennae 1.8 times length of second antennal segment. Frontal carina low and elongate.

Groove between metapleural pits narrow, deep, shiny and sculptured; pits small; posterior metapleuron pilose. Scutellum shiny. Tarsal comb of fore leg crescent-shaped, with 30 - 40 teeth set wide apart.

Anterior part of propodeum V-shaped, smooth, shiny and without setae. Posterior and lateral areas of propodeum sparsely covered with long white setae. Propodeum with a broad, deep, sculptured, median groove; with raised lines in a distinct pattern laterally. Petiole 4 times as long as maximum width; rounded above, each side with a small carina developed posteriorly; rounded beneath except for a flat apex. Dorsal apex of petiole without a small depression. Ventral apex of petiole mostly dull, shiny along edges; membranous area in a vertical plane, 9 times as long as broad, bordered by a posteriorly curved band which is weak laterally but becomes wider medially (fig. 16). Apical segment of gonocoxite 3 times as wide as gonostylus (fig. 4); with many medium-sized setae. Gonostylus 5 times as long as broad; with 3 visible medium-sized setae, followed posteriorly by many minute setae. Volsella with a small lobelike sack developed at apex.

Female. Length 11 - 13 mm. Similar to male except as follows: A strong genal spine projecting straight downward without twisting at base (fig. 26); spine sometimes reduced. Third antennal segment 5.0 times as long as second. Distance between antennae 3.0 times length of second antennal segment. Edge of preoccipital ridge 0.33 mm. wide, hardly visible.

Groove between metapleural pits shiny, appearing as a V-shaped trough; pits large. Scutellum flat and shiny.

Anterior part of propodeum shiny except dull in middle. Base of propodeum with a few short raised lines and a deep elongate median groove; clothed with long silver setae. Petiole 3.6 times as long as maximum width, slightly arched and rounded above.

Type in British Museum (Nat. Hist.).

Specimens examined. KAUAI: 3 females, Halemanu, June, Aug. H. T. Osborn, O. H. Swezey; female, Kamuwela, July, Swezey; male, Kokee, July, Swezey (HSPA).

This rather distinct species exhibits pitchy black, slightly violet iridescent wing coloration which serves as a convenient character for separating it from the allied species, *N. kauaiensis*. In the female, the genal

spine differs from that of *kauaiensis* in that it extends downward without forward curvature, the apical part tapering to a blunt point. In the male of *sciopteryx* the shiny semi-membranous area is in a vertical plane, but in *kauaiensis* the membranous area is in a horizontal plane.

Nesomimesa perkinsi, new species (figs. 5, 17).

Male. Length 9 - 10 mm. Fore wing infuscate. Third antennal segment 4.2 times as long as second. A small acute point between antennae. Distance between antennae 1.3 times length of second segment. Frontal carina small and not clearly visible beneath pilose area.

Groove between metapleural pits shiny and deep; anterior metapleural pit larger than posterior. Scutellum shiny. Tarsal comb of fore leg with approximately 35 teeth of uniform length.

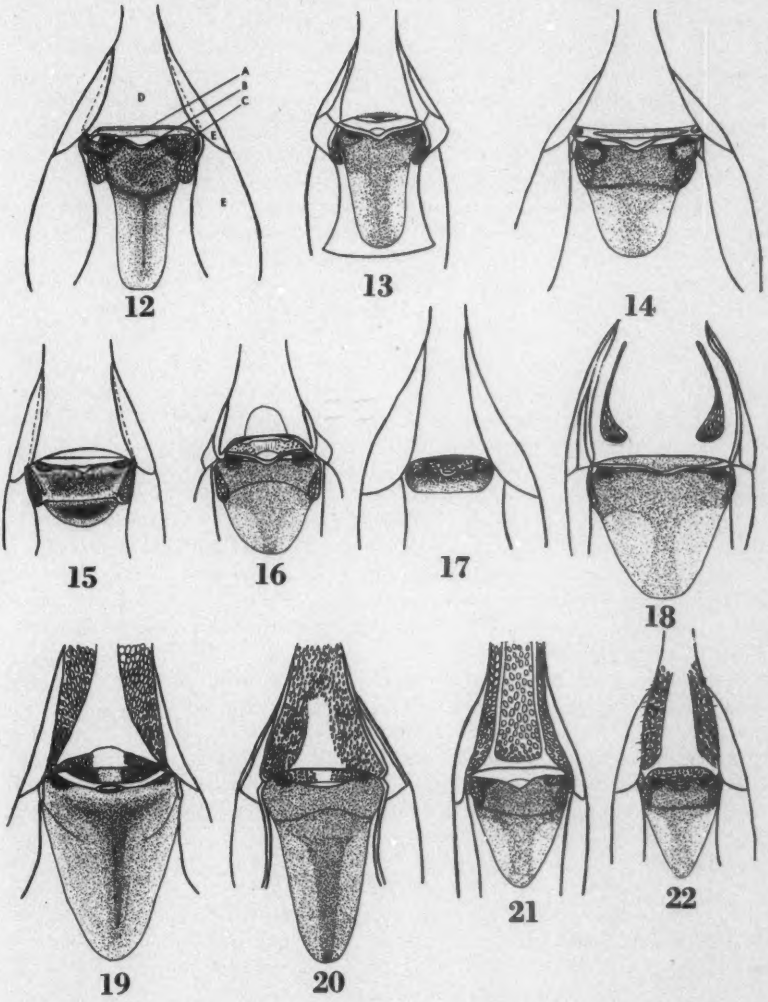
Anterior part of propodeum coarsely punctate; longitudinal groove at base of propodeum deeply sculptured. Petiole 4.5 times as long as maximum width, somewhat rounded above; a small carina developed along each lateral edge close to base; rounded beneath. A small depression at base of second abdominal tergite. Semi-membranous area of ventral apex of petiole in a vertical plane, 10 times as long as wide, with a deep longitudinal furrow in center, bordered posteriorly by large punctured band with an oval depression in middle (fig. 17). Apical segment of gonocoxite (fig. 5) 3.6 times as wide as gonostylus, with numerous setae. Gonostylus 6 times as long as broad, with numerous setae. Volsella somewhat cone-shaped, with inner margin spinous.

Holotype (BISHOP 2739): male, Wailupe, Oahu, May 30, 1919, coll. O. H. Swezey.

Paratypes: male, Mt. Tantalus, Oahu, Nov., 1906, O. H. Swezey; male, Mt. Tantalus, Oahu, Dec., 1911, W. M. Giffard (HSPA); 2 males, Lanihuli R., Oahu, Sept., 1911, J. C. Bridwell (BISHOP).

Female. Unknown.

The membranous area of the ventral apex of the petiole is 10 times as long as wide, and is reduced to a deep furrow which is bordered posteriorly by a large punctate band with an oval depression in the middle. These characters will separate the new species from *antennata* and *hawaiiensis.* In addition, the volsella of the male genitalia of this species is cone-shaped with numerous spines on the inner margin (fig. 5), while the volsella of *hawaiiensis* (fig. 1) and *antennata* (fig. 2) are digitiform with fewer spines and setae. The gonostylus of *perkinsi* has as many setate as *hawaiiensis,* but twice as many as *antennata.* I believe that the female, when captured, will exhibit distinct morphological characters.



FIGS. 12–17. Ventral apex of petiole of Nesomimesa. 12, N. hawaiiensis: A, membranous area; B. band; C, depression; D, apical portion of the ventral petiole, E, abdominal tergite; 13, *N. antennata;* 14, *N. nitida;* 15, *N. kauaiensis;* 16, *N. sciopteryx;* 17, *N. perkinsi.*

FIGS. 18–22. Ventral apex of petiole of *Deinomimesa.* 18, *D. cognata;* 19, *D. ferox;* 20, *D. haleakalae;* 21, *D. hawaiiensis;* 22, *D. punae.*

Nesomimesa kauaiensis Perkins (fig. 6, 15, 27).
Nesomimesa kauaiensis Perkins, 1899.

Male. Length 8.5 - 13 mm. Fore wing subhyaline. Third antennal segment 5.0 times as long as second. A short acute point between antennae. Distance between antennae 2.0 times length of second antennal segment. Frontal carina low and elongate.

Groove between metapleural pits shiny and deeply sculptured; pits large. Scutellum with a weak longitudinal groove in middle. Tarsal comb of fore leg crescent-shaped, with 30 teeth.

Anterior part of propodeum smooth and bare; rest of propodeum sparsely covered with long white setae. Base of propodeum with a few median raised lines. Petiole 4 - 4.5 times as long as maximum width, rounded above, the venter more or less flattened. A small depression at base of second abdominal tergite. Semi-membranous area of ventral apex of petiole 4 - 5 times as long as wide, bordered posteriorly by thick band slightly protruding in middle (fig. 15). Apical segment of gonocoxite (fig. 6) 5 times as wide as gonostylus, with setae longer than in other species, its apex conspicuously curved. Gonostylus 9 times as long as broad, with scattered long setae at inner margin. Volsella resembling that of *N. sciopteryx*.

Female. Length 11 - 13 mm. Similar to male except as follows: Genal spine present, not twisted at base, curved forward and sharply pointed at apex when fully developed (fig. 27); spine sometimes reduced, triangular in shape. Third antennal segment 4.3 times as long as second. Distance between antennae 2.5 times length of second antennal segment. Edge of preoccipital ridge 0.03 mm. wide.

Groove between metapleural pits narrow and shiny; pits small. Scutellum flat and shiny. Postscutellum shiny, with a faint median longitudinal groove.

Anterior part of propodeum smooth and polished except dull in middle. Base of propodeum with two short raised lines and a deep, median, longitudinal, sculptured groove. Petiole 4 - 4.5 times as long as maximum width, rounded above and at base, with a median raised line which gradually increases in height apically.

Specimens examined. Paratypes at Bishop Museum: 6 males, 5 females, Mts. Waimea, Kauai, 950 m., 1,200 m., May, June, 1894; male, Koholuamanu, Kauai, 1,200 m., Apr., 1895, R. C. L. Perkins.

KAUAI: male, 9 females, Koholuamanu, 1,200 m., May, July, Aug., W. M. Giffard; female, Kumuwela, July, O. H. Swezey; female, Kokee, Aug., Swezey (BISHOP, HSPA).

This species can be separated from *N. sciopteryx* by the lighter color of the wings. In *kauaiensis* the semi-membranous area is 4 - 5 times as long as wide and is bordered posteriorly by a medially humped band, whereas, in *sciopteryx*, the membranous area is 9 times as long as wide,

and the posterior bordering band is flat in the middle.

Genus Deinomimesa Perkins

Deinomimesa Perkins 1899, Fauna Hawaiiensis 1:11. (Type: *Deinomimesa ferox* Perkins; subsequent designation by Pate, 1937).

Medium or small-sized black species; male elongate and female robust. Fore wing 6–9 mm. long.

Clypeus densely pilose, truncate, with its margin somewhat elevated in middle in male; greatly raised, exposing labrum entirely or in part in female. Mandible large and greatly curved in female; small and partially hidden beneath clypeus in male. Antennae clavate in female and subclavate in male; basal segments entirely fuscous, five apical segments orange-yellowish beneath. Second cubital cell petiolate or narrower at radius and wider below. Second recurrent vein of fore wing sigmoid, arising on cubitus three-fourths the distance between second and third intercubital veins. Head and thorax minutely punctate. Fore tarsus generally testaceous in male and fuscous in female. Propodeum pilose, with many distinct raised lines. Abdomen ferrugineus, shiny and smooth. Petiole generally 1 to 7 times as long as maximum width; distinctly carinate in female, more so than in male. Ventral apex of petiole with membranous or semi-membranous area bordered posteriorly by a medially rounded sclerotized band, followed by a deep rectangular depression which rises apically in a gradual incline. Pygidial area flat, spinose, punctate and carinate along edges. Male genitalia (figs. 7–11) nearly twice as large as in *Nesomimesa*.

Key to Species of Deinomimesa

1. Males; clypeus truncate, round or slightly emarginate apically in middle; labrum unexposed 2
   Females; clypeus protruding; labrum partly or wholly exposed 6
2. Petiole with a narrow, strongly-raised, medio-dorsal longitudinal carina ..... **ferox**
   Petiole without such a carina, carinae if present less strongly developed 3
3. Petiole stout, 0.4 mm. wide, 1.2–1.3 mm. long; with a medium-sized mediodorsal longitudinal carina and a smaller carina along each lateral margin ..... **cognata**
   Petiole elongate, 0.2 mm. wide and 1.3–1.6 mm. long, with a relatively small medio-dorsal longitudinal carina; with or without smaller lateral carinae 4
4. Petiole somewhat roof-shaped above ..... **haleakalae**
   Petiole flattened above 5

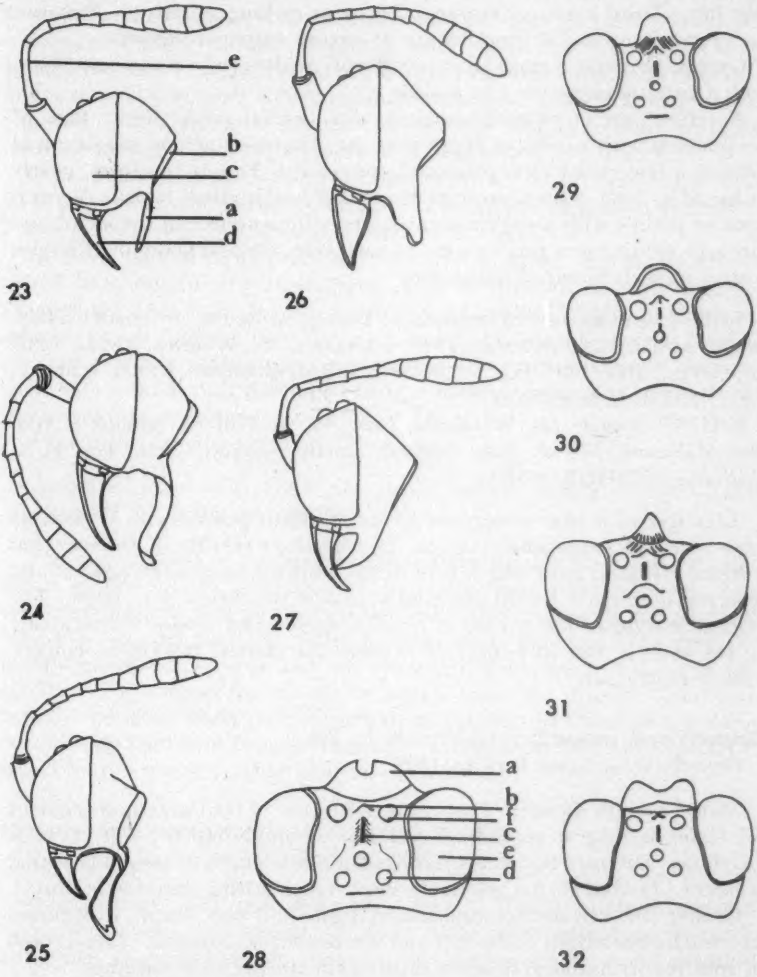
5. Petiole flattened at its sides, its edges somewhat sharp dorsally ..... **hawaiiensis**
   Petiole not flattened at its sides; its edges somewhat carinate and rounded ..... **punae**
6. Clypeus with a deep, square emargination in middle (fig. 28) ..... **ferox**
   Clypeus either not deeply emarginate, or with a semi-circular emargination 7
7. Clypeus with a broad semi-circular emargination (fig. 32) ..... **cognata**
   Clypeus not emarginate 8
8. Clypeal margin angulate and pointed in middle (fig. 31) ..... **haleakalae**
   Clypeal margin rounded 9
9. Clypeus wide, broadly rounded, semi-spherical in shape and extending a greater distance downward; labrum only partly exposed (fig. 30) ..... **hawaiiensis**
   Clypeus narrower, subacutely rounded and extending a shorter distance downward; labrum almost completely exposed (fig. 29) ..... **punae**

Deinomimesa ferox Perkins (figs. 7, 19, 28).
Deinomimesa ferox Perkins, 1899.

Male. Length 9–10 mm. Fore wing infuscate along apical margin, less cloudy at base. Third antennal segment 6.0 times as long as second. A short acute point between antennae. Distance between antennae 2.3 times length of second antennal segment. Frontal carina low at both ends, height increasing slightly toward middle, so that it appears somewhat humped in profile.

Groove between metapleural pits deep, shiny and V-shaped; pits large. Scutellum dull and rounded; postscutellum with median raised lines. Tarsal comb of fore leg slightly curved, with about 35 uniform, widely separated teeth.

Anterior part of propodeum dull, with medium punctation; with large raised parallel lines extending diagonally on each side from base of postscutellum forming a series of V-shaped carinae. Entire propodeum with prominent raised lines; a short, wide, longitudinal sculptured groove in center. Petiole 3 times as long as maximum width, pyriform, its sides flattened, with a narrow, sharply raised, median longitudinal carina. Ventral apex of petiole triangularly flat in middle, its posterior margin slightly elevated; membranous area in a horizontal plane, 4–5 times as long as wide, shiny, bordered posteriorly by a wide band with an oval-shaped opening in middle (fig. 19). Apical segment of gonocoxite (fig. 7) 3 times as wide as gonostylus, with several minute setae; a dense area of setae on preceding segment. Gonostylus 2 times as long as broad, pointed, with group of setae at its apex, the terminal area flat. Volsella with minute setae.



FIGS. 23–27. Lateral view of the heads of female *Nesomimesa*. 23, *N. hawaiiensis*: a, genal spine; b, preoccipital ridge; c, compound eye; d, mandible; e, antenna; 24, *N. antennata;* 25, *N. nitida;* 26, *N. sciopteryx;* 27, *N. kauaiensis.*

FIGS. 28–32. Dorsal view of the heads of female *Deinomimesa*. 28, *ferox*: a, clypeus; b, cone-shaped projection between antennae; c, frontal carina; d, ocellus; e, compound eye; f, antennal fossa; 29, *D. punae;* 30, *D. hawaiiensis;* 31, *D. haleakalae;* 32, *D. cognata.*

Female. Length 11–13 mm. Similar to male except as follows: Clypeal margin deeply and squarely emarginate in middle, exposing entire labrum (fig. 28). Third antennal segment 5.7 times as long as second. Distance between antennae, 2.0 times length of second antennal segment.

Groove between metapleural pits deeply sculptured. Scutellum shiny, with a longitudinal groove in middle.

Anterior part of propodeum dull, with several raised lines. Base of propodeum with a concave depression and a narrow, median longitudinal groove; a few raised lines produced posteriorly. Petiole pyriform, nearly as broad as long, with a prominent median longitudinal carina. Ventral apex of petiole with a slight concave depression anterior to the membranous area which has a small carina at each side. Second abdominal tergite with a median longitudinal groove.

Specimens examined. Paratypes at Bishop Museum: 5 females, Halemanu, Kauai, 1,200 m., May, 1895; 3 females, Mt. Waimea, Kauai, 1,200 m., 600 m., May, 1894, Feb., 1897; female, Kaholuamanu, Kauai, 1,200 m., Apr., 1895 R. C. L. Perkins.

KAUAI: female Mt. Waialeale, June, W. M. Giffard; female, Robinson, Makaweli, 570 m., July, Giffard; female, Summit Camp, Feb. F. X. Williams (BISHOP, HSPA).

This species is best recognized by its pyriform petiole with its sharply raised median longitudinal carina. *D. cognata,* a relative of *D. ferox,* has a wider median carina which is of nearly uniform height throughout and does not increase in height posteriorly, as does the carina of *D. ferox.* The clypeal margin of the female of *ferox* is deeply and squarely emarginate in the middle, but in female of *cognata* the clypeal margin is semi-circularly emarginate.

Deinomimesa punae Perkins (figs. 8, 22, 29).
Deinomimesa punae Perkins, 1899.

Male. Length 10 mm. Fore wing infuscate. Third antennal segment 4.7 times as long as second. A tall and pyramid-shaped point between antennae. Distance between antennae 2.3 times length of second antennal segment. Frontal carina relatively short, not reaching anterior ocellus.

Groove between metapleural pits elongate and very deeply sculptured; pits small. Scutellum pubescent and not heavily sculptured. Tarsal comb of fore leg with about 40 teeth of uniform size set close together.

Anterior part of propodeum shiny, with several prominent vertical and slightly raised diagonal lines. Base and lateral areas of propodeum with more strongly raised lines. Petiole 5 times as long as maximum width, with a small median longitudinal carina; a small carina along each lateral margin; rounded beneath. Ventral apex of petiole flat and pubescent; its side pilose, with large prominent punctures. Semi-membranous area in a vertical plane, 5–6 times as long as wide, bordered

posteriorly by narrow band protruding roundly in middle (fig. 22). Apical segment of gonocoxite (fig. 8) 2.6 times as wide as gonostylus. Gonostylus 2.7 times as long as broad. Setae of volsella hardly visible.

Female. Length 10 mm. Similar to male except as follows: Fore wing subhyaline and slightly iridescent. Clypeus narrow, subacutely rounded and extending a short distance downward; labrum nearly all exposed (fig. 29). Third antennal segment 4.0 times as long as second. Distance between antennae 2.0 times length of second antennal segment.

Groove between metaplural pits narrow and deep. Scutellum dull, with scattered medium-sized punctures; a longitudinal groove in middle. Postscutellum dull, with many curved raised lines.

Anterior part of propodeum dull, densely punctate, with many curved raised lines dominating entire area. Base of propodeum with semi-circular raised lines, followed by a narrow, deep, median longitudinal groove which extends half the distance to the apex. Petiole 6.5 times as long as maximum width, with median raised lines near apex of dorsum, its sides each with a small well developed carina. Second abdominal tergite without a longitudinal groove.

Type in British Museum (Nat. Hist.).

Specimens examined. HAWAII: male, female, Hualalai, 2,000–2,200 m., Aug., F. X. Williams (HSPA).

The lateral areas of the ventral apex of the petiole are pubescent and pilose in this species, whereas in *hawaiiensis,* these areas are bare. The semi-membranous area of *punae* is bordered posteriorly by a narrow band which is rounded medially, while in *hawaiiensis* the band bordering the membranous area is weak and has a triangular-shaped protrusion in the middle. The clypeal margin of the female of *punae* is narrow and subacutely rounded, whereas in the female of *hawaiiensis* the clypeal margin is relatively wide and broadly rounded. The gonostylus of this species is larger with fewer setae than that of *hawaiiensis.*

Deinomimesa hawaiiensis Perkins (figs. 9, 21, 30).

Deinomimesa hawaiiensis Perkins, 1899.

Male. Length 7–9 mm. Fore wing smoky. Third antennal segment 3.75 times as long as second. A short acute point developed between antennae. Distance between antennae 1.5 times length of second antennal segment. Frontal carina low, bearly visible through pilosity.

Groove between metapleural pits narrow; pits small. Scutellum pubescent and not heavily sculptured. Tarsal comb of fore leg with approximately 30 teeth of uniform size.

Anterior part of propodeum with longitudinal raised lines; its pilose base with many broad raised lines. Petiole 7 times as long as maximum width, its sides flattened, with sharp corners along each edge, rounded

beneath; with a median longitudinal carina. Ventral apex of petiole shiny, flat, and without setae; each lateral margin with a small prominent carina and large punctations. Membranous area in a horizontal plane, 10 times as long as wide, bordered posteriorly by a weak band with a triangular-shaped projection in middle (fig. 21). Apical segment of gonocoxite (fig. 9) 3.8 times as wide as gonostylus, with a few setae along its periphery; a cluster of setae on preceding segment. Gonostylus 3 times as long as broad; with setae along dorso-lateral edge. Volsella with few setae.

Female. Length 10–11 mm. Similar to male except as follows: Clypeus raised, its margin strongly rounded partially exposing the labrum (fig. 30). Third antennal segment 4.0 times as long as second. Distance between antennae 2.0 times length of second segment.

Groove between metapleural pits very narrow. Scutellum dull, with large punctation; postscutellum with many curved raised lines.

Anterior part of propodeum dull, triangulate, its outline shiny. Two heavy raised parallel lines extending from base of propodeum to middle; area between these with a deep, wide depression with an elongate shiny median groove. Petiole 6 times as long as maximum width, with a median longitudinal carina; its lateral margins each with a well developed small carina. Second abdominal tergite with a longitudinal groove.

Specimens examined. Paratypes at Bishop Museum: 3 males Kau, Hawaii, 1,200 m., July, 1895, R. C. L. Perkins.

HAWAII: 15 males, 2 females, Kilauea, 1,200 m., July, Aug., Perkins, W. M. Giffard; 5 males, Hualalai, 2,200 m., Aug., F. X. Williams (BISHOP, HSPA).

In order to separate males of this species from those of *D. punae,* it is important to check for the absence of setae at the lateral apex of the petiole and, in addition, to note the narrow membranous area with its median triangular-shaped band. The female of *hawaiiensis* can be distinguished from that of *punae* by its wider and semi-spherical shaped clypeal margin.

Deinomimesa haleakalae Perkins (figs. 10, 20, 31).
Deinomimesa haleakalae Perkins, 1899.

Male. Length 8–9 mm. Fore wing subhyaline to infuscate. Third antennal segment 6.0 times as long as second. A tall, flat-topped projection developed between antennae. Distance between antennae 2.3 times length of second antennal segment. Frontal carina small but distinct.

Groove between metapleural pits deep and shiny. Scutellum dull, more or less rounded; postscutellum with many raised lines. Tarsal comb of fore leg slightly curved, with about 40 teeth set close together.

Anterior part of propodeum dull, without setae, and with five sets of

medium sized raised lines extending from base of postscutellum to center of propodeum. Basal portion of propodeum with large raised lines, sparsely pilose; with a short, wide, sculptured, median longitudinal groove. Petiole 6 times as long as maximum width, roof-shaped, with a small longitudinal carina along each lateral margin; rounded beneath. Ventral apex of petiole flat in center, strongly sculptured laterally. Semi-membranous area in vertical plane, 6–7 times as long as wide, shiny, with minute punctures, bordered posteriorly by a flat band protruding at its middle (fig. 20). Apical segment of gonocoxite (fig. 10) 4 times as wide as gonostylus; a few scattered setae at apex. Gonostylus 3 times as long as broad; inner margin with numerous setae. Volsella in shape of an elongate tube.

Female. Length 11–12 mm. Similar to male except as follows: Fore wing infuscate except for sightly darker marginal cell. Clypeal margin angulate and pointed in middle; labrum entirely exposed (fig. 31). Third antennal segment 4.0 times as long as second. Distance between antennae 2.1 times length of second antennal segment.

Groove between metapleural pits wide, shiny. Scutellum flat; post-scutellum dull, pubescent, with a few raised lines at base.

Anterior part of propodeum shiny, with median raised lines. Petiole 5.2 times as long as broad, without a median longitudinal carina; the dorsal surface more or less rounded and without small carinae at its edges.

Specimens examined. Paratypes at Bishop Museum: 2 males, Haleakala, Maui, 1,200 m., May, 1896, R. C. L. Perkins.

MAUI: female, Haipuaena, June, E. H. Bryan; female, Olinda, 1,660 m., May, W. M. Giffard and D. T. Fullaway; 5 males, Ukulele, Aug., N. L. H. Krauss (BISHOP).

The male of *D. haleakalae* is distinguished from those of *D. hawaiiensis* and *D. punae* by its petiole, which is roof-shaped above with a slight median longitudinal carina. Also, in the latter two (figs. 21–22), there is heavy punctation along the lateral and basal part of the ventral apex of the petiole, whereas in *D. haleakalae* the punctation is weak (fig. 20). The semi-membranous area is shiny with minute punctures and is surrounded apically by a flat band, partly protruding in the middle. The female *haleakalae* is easily separated from those of *hawaiiensis* and *punae* by its clypeal margin which is angulate and projects as a sharp point medially.

Deinomimesa cognata Perkins (figs. 11, 18, 32).
Deinomimesa cognata Perkins, 1899.

Male. Length 8–9 mm. Fore wing subhyaline. Third antennal segment 6.0 times as long as second. A short acute point between antennae. Distance between antennae 2.6 times length of second antennal segment. Frontal carina low, visible beneath sparse, long, white setae.

Groove between metapleural pits somewhat shiny and shallow; pits large. Scutellum flat, dull, with no visible groove. Tarsal comb of fore leg with about 40 teeth.

Anterior part of propodeum dull, without setae, with a slight indication of a median longitudinal line, and with 3 diagonal raised lines laterally. Base of propodeum with strongly raised lines. Petiole 3.1 times as long as maximum width, with a median longitudinal carina and a small carina along each lateral margin; rounded beneath. Ventral apex of petiole flat and shiny in middle, with a heavily sculptured or punctured carina at each side; membranous area in a horizontal plane, 13 times as long as wide, bordered posteriorly by a thin medially protruding band (fig. 18). Apical segment of gonocoxite (fig. 11) 4 times as wide as gonostylus. Gonostylus 3 times as long as broad, with few setae at its apical margin. Volsella similar to that of *D. ferox*.

Female. Length 10–12 mm. Fore wing smoky. Clypeal margin broad and semi-circularly emarginate in middle (fig. 32); labrum partly exposed. Third antennal segment 4.2 times as long as long as second. Distance between antennae 3.0 times length of second antennal segment.

Groove between metapleural pits shiny and deep. Scutellum with a slight median longitudinal indentation.

Anterior part of propodeum polished. Petiole 1.4 times as long as maximum width, becoming wider dorso-ventrally toward apex, with a median dorsal longitudinal carina which gradually increases in height toward the apex. A slight horizontal indentation on base of second abdominal tergite. Ventral apex of petiole with a deep, wide, convex depression in middle.

Specimens examined. Paratypes at Bishop Museum: male, 2 females, Halemanu, Kauai, 1,200 m., May, 1895, R. C. L. Perkins.

KAUAI: 2 males, Kalalau trail, June, Aug., O. H. Swezey; 2 females, Alakai Swamp, July, C. N. Forbes; male, Kaholuamanu, Apr., Swezey; male, Kokee, June, H. T. Osborn; 2 males, 2 females, Kumuwela, June, July, Swezey (BISHOP, HSPA).

The male of this species can be distinguished from other species of *Deinomimesa* by the prescence of a heavily punctate lateral carina on each side of the ventral apex of the petiole. The membranous area is elongate, and is bordered posteriorly by a thin band which protrudes roundly in the middle. The clypeal margin of the female of *cognata* differs from that of other *Deinomimesa* females in that it is broadly and roundly emarginate.

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Trapping of Air-borne Insects on Ships on the Pacific (Part II)[1]

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(Presented at the meeting of December 15, 1958)

This is the second report on the trapping of air-borne insects in connection with the project "Zoogeography and Evolution of Pacific Insects" (see Part I, Gressitt and Nakata, 1957, Proc. Haw. Ent. Soc. 16 (3) :363–365). This report covers the period from January to December, 1958. Thanks are expressed to Rear Admiral S. H. Evans, U.S.C.G.; Lt. (jg.) Charles L. Smith, M.S.T.S. Operations Officer; officers and men of the U.S. Navy; the Military Sea Transportation Service; and the U.S. Coast Guard stationed in Hawaii for their cooperation. Also, we are grateful for assistance and advice from David Blumenstock of the U.S. Weather Bureau, Martin Sherman of the Entomology Department, Hawaii Agriculture Experiment Station, and the Hawaiian Aeronautics Commission. We are grateful to the California Spray Chemical Co. for sending us additional "deadline" adhesive material. Carole Worthington, Carl Isenberg, Solomon Kalima, and Shinsaku Kimoto have helped in the work. The diagram of the wind sock trap was made by Dorothy Rainwater.

The cubical aluminum frame traps with removable screens on five sides (see Part I) were put in operation on Honolulu-Guam-Philippines and on Honolulu-Guam routes of M.S.T.S. ships. Resin-castor oil "deadline" mixtures were painted on the screens which were exposed for 24 hours. On each trip, 50 screens (44.3 cm. square) were kept in a single 45 x 50 x 68 cm. aluminum container. These screens were operated from Honolulu to the Philippines and then back to Guam as indicated by the arrows (Table I). On the Guam cruises, screens were operated both ways as indicated by the arrows (Table II). The traps were not in commission for the 24 hours immediately after leaving or before entering a port.

Two types of traps were used aboard the Coast Guard ships: the above cubical trap with screens, and a trap utilizing a wind sock. The first experimental wind sock trap consisted of one end of an 25 cm. diameter can with vertical rod set in ball-bearings and evenly spaced hooks soldered on the back end. A medium weight muslin sleeve, 60 cm. long,

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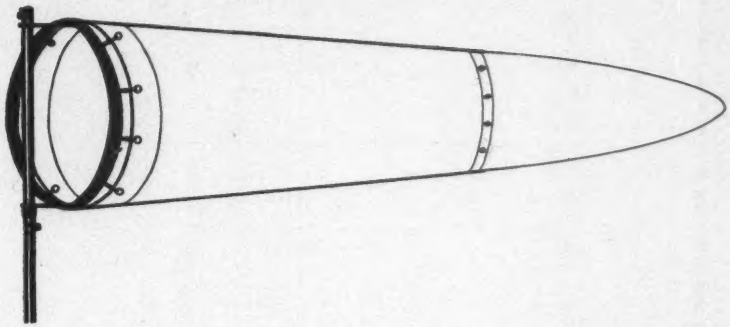

FIG. 1. Diagram of wind sock insect trap.

with grommets at the periphery of the larger opening was attached to the hooks of the frame by a cord threaded through holes; and a 30 cm. long cone-shaped nylon net was fastened on to the outer end of sleeve by several buttons. The second trap (fig. 1), was made from a 50 cm. diameter, 3 x 38 mm. flat iron bar ring welded to two 38 cm. bar strips at right angles. A heavy muslin sleeve, 60 cm. long with grommets, was fastened by metal snaps on to the bar ring, and, on opposite end, a 60 cm. rounded apex net was positioned to the sleeve by buttons. The complete wind sock frame was rotated on a 1.5 m. vertical galvanized pipe.

The nylon nets were first dipped into a 5 percent endrin water mixture; then momentarily were allowed to dry, after which an aerosol spray containing DDT and pyrethrum was applied to the inside of the net. In order that the chemicals applied would have longer residual effect, the nets were changed during sunset hours.

The nets were changed daily, and a total of 21 days of trapping was done at the station "Victor", a coast guard weather and rescue station located between the Hawaiian Island chain, Japan, and the Bonin Islands. The screen traps were operated, with daily screen changes, one way between Honolulu and Yokosuka, Japan, and, with one set of screens exposed per week, at the station (Table III).

Records (Table III) representing the trapped specimens collected both in cone-shaped and rounded apex nets indicate that the latter type tends to injure specimens to a much greater degree, probably because of a greater air circulation within the net crushing or entirely blowing specimens out of the net. The former does not impair specimens, because of the lesser air movements at the cone-shaped bottom. The week-long exposure of the screen trap at station "Victor" probably permitted in-

TABLE I. Insects collected from screen traps on ships traveling from Hawaii to the Philippines and returning to Guam as indicated by arrows (4 cruises).

	24 hours periods of trapping at sea					
	PHILIPPINES ← →	← →	NEAR GUAM ← →	←	←	HAWAII ←
Longitude	120°–137°E	137°–146°	146°–157°	157°–168°	168°–172°	172°E–171°W
Coleoptera						
Coccinellidae			1			
Scolytidae			1			
Anthribidae						
Araecerus	1	1	2		1	
Homoptera						
Cerocopidae			1			
Hemiptera						
Lygaeidae			1			
Diptera						
Sciaridae						1
Chironimidae	1					
Acalyptrate			1			
Chloropidae			1			
Ephydridae?				1		
Hymenoptera						
Chalcididae			4			
Ceraphronidae	1					
Formicidae	2		4			
Apoidea			1			

TABLE II. Insects collected from screen traps on ships traveling from Honolulu to Guam and returning to Hawaii (3 cruises).

	24 hours periods of trapping at sea						
	NEAR GUAM		NEAR KWAJALEIN				HAWAII
	← →	← →	← →	← →	← →	← →	← →
Longitude	144°–151°E	151°–160°	160°–168°	168°–177°	177°E–172°W	172°–166°	166°–158°W
Coleoptera							
Cerambycidae:							
Chlorophrous annularis (Fabr.)					1		
Anthribidae		1					
Bruchidae		1					
Diptera							
Culicidae: *Culex?*					1		
Sciaridae: *Sciara?*							
Drosophilidae	3		1				
Hymenoptera	1						
Formicidae			1				

TABLE III. Insects collected from screens and wind sock traps on ships en route from Hawaii to station "Victor" and on to Yokosuka, Japan (2 cruises).

JAPAN	YOKOSUKA, ←		STATION "VICTOR"**			←		HAWAII
Longitude			142°–154°E	154°–164°	164°E	164°–166°	166°–175°	175°E–177°W	177°–166°
	Fragments	Trap							
Araneida									
Argiopidae (Young)		Screen	1						
Isoptera									
Rhinotermitidae *Coptotermes*	Wings	Screen						2	
Rhinotermitidae *Coptotermes*		Net			2				
Unknown?	Abdominal sternite	Net*			1				
Coleoptera									
Coccinellidae		Net			1				
Staphaylinidae (small)		Net			1				
Unknown?	Third thor. sternite	Net*			1				
Diptera									
Drosophilidae	Wings & abdomen	Screen					1		
Lepidoptera									
Gelechiidae?		Net			1				
Hymenoptera									
Aganotidae		Net			2				
Braconidae	Wing	Screen	1						
Formicidae	Wing & thorax	Net*			1				

*Insect fragments collected in rounded apex type net.

**A total of 21 days of trapping at station "Victor", and each other longitude column represents a single day of trapping at sea.

sects to be blown off the screens as the adhesive dried.

From the above data and those presented in the previous report, it is apparent that only a small number of air-borne specimens have been caught to date. Several years of work will be required in the future to obtain needed information on the degree of dispersal and the types of insects involved in such dispersal. In general, most of the specimens secured in our traps were representatives of smaller more weakly flying groups of insects, and other small arthropods. More specimens were taken close to land than in mid-ocean, corroborating findings presented in the first paper of this series.

New Immigrant Records for the Year 1958

Species marked with an asterisk were reported from the Hawaiian Islands for the first time during 1958 on the dates recorded in the text. Those not so marked were observed here earlier but have only now been identified. Species marked with a dagger are considered doubtfully established as these records are based on single specimens.

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*Carpophilus marginellus Motschulsky (Coleoptera: Nitidulidae)	8
Geococcus coffeae Green (Homoptera: Pseudococcidae)	10
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